Attachment A

Flow Frequency Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
3019 Peters Creek Road Roanoke, Virginia 24019

SUBJECT: Flow Frequency Determination
GP Big Island LLC – Reissuance (VA0003026)

TO: Permit File

FROM: Becky L. France, Water Permit Writer

DATE: October 8, 2014 (Revised 1/16/15)

This memorandum supersedes the May 12, 2010 memorandum concerning the subject VPDES permit.

GP Big Island discharges via several outfalls to the James River, one storm water outfall to Reed Creek, and three storm water outfalls to unnamed tributaries. All of these outfalls are located near Big Island, Virginia. Stream flow frequencies are required at this site to develop effluent limitations for the VPDES permit.

The USGS has operated a continuous record gauge downstream of the discharges on the James River at Holcombs Rock, Virginia (#02025500) since 1939. The flow has been regulated by Gathright Dam at Lake Moomaw since 1979. The flow frequencies for the discharge points were determined using drainage area proportions and have been reduced by the outfall discharges below and including the discharge point. This analysis does not address any other withdrawals, discharges, or springs that may lie between the gauge and outfalls. The high flow months are January through May. Flow frequencies for outfalls 002 and 003 are listed on the attached table. The other outfalls consist of only stormwater, and therefore flow frequencies are not needed to determine water quality criteria applicable to these discharges.

Flow Frequency Determination: GP Big Island

High Flow Months January through May

Reference Gauge (data from 1980 to 2011)					
James River at Holcombs Rock, VA (#02025500)					
Drainage Area [mi^2] =	3,256				
	ft^3/s	MGD		ft^3/s	MGD
1Q10 =	336	217	High Flow 1Q10 =	762	492
7Q10 =	424	274	High Flow 7Q10 =	892	576
30Q5 =	554	358	HM =	1,560	1,008
30Q10=	487	315	High Flow 30Q10=	1,080	698

Flow frequencies for the reissued permit (4/1/15)					
James River above Outfall 003					
Drainage Area [mi^2] =	**3,134.0**				
	ft^3/s	**MGD**		**ft^3/s**	**MGD**
1Q10 =	**315**	**203**	**High Flow 1Q10 =**	**725**	**468**
7Q10 =	**399**	**258**	**High Flow 7Q10 =**	**850**	**549**
30Q5 =	**533**	**345**	**HM =**	**1,493**	**965**
30Q10=	**460**	**297**	**High Flow 30Q10=**	**1,031**	**666**

Flow frequencies for the reissued permit (4/1/15)					
James River above Outfall 002					
Drainage Area [mi^2] =	**3,105.0**				
	ft^3/s	**MGD**		**ft^3/s**	**MGD**
1Q10 =	**308**	**199**	**High Flow 1Q10 =**	**718**	**464**
7Q10 =	**393**	**254**	**High Flow 7Q10 =**	**844**	**545**
30Q5 =	**518**	**335**	**HM =**	**1,486**	**961**
30Q10=	**454**	**293**	**High Flow 30Q10=**	**1,024**	**662**

Outfall 002	unadjusted flow-002 discharge-003 discharge
Outfall 003	unadjusted flow - 003 discharge

Discharges

Outfall	Maximum 30 Average (MGD)
Outfall 002	6.15
Outfall 003	8.91

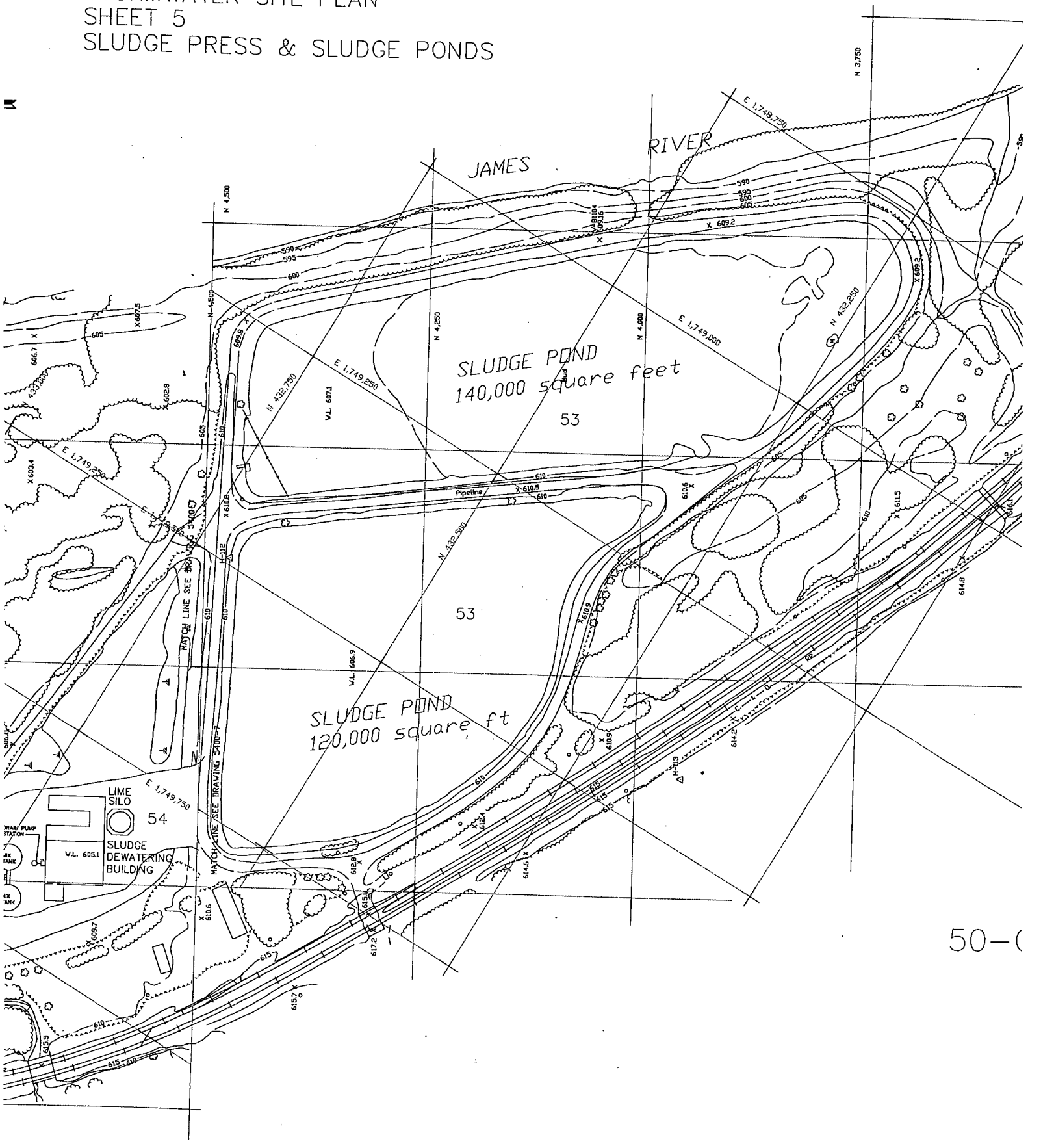
SITEID	NAME	RECORD	LATLONG	DAAREA	HARMEAN	HF30Q10	HF7Q10	HF1Q10	Z30Q5	Z30Q10	Z7Q10	Z1Q10	Z1Q30	HFMTHS	Statperiod	Yrstrn	Notes
02025500	James River at Holcombs Rock, Va.	R, 1926-	Lat 37 30'05", Long 79 15'45", NAD 83	3256	1560	1080	892	762	554	487	424	336	310	JAN-MAY	1980-2011	2012	Flow regulated by Lake Moomaw since Dec 1979

Attachment B

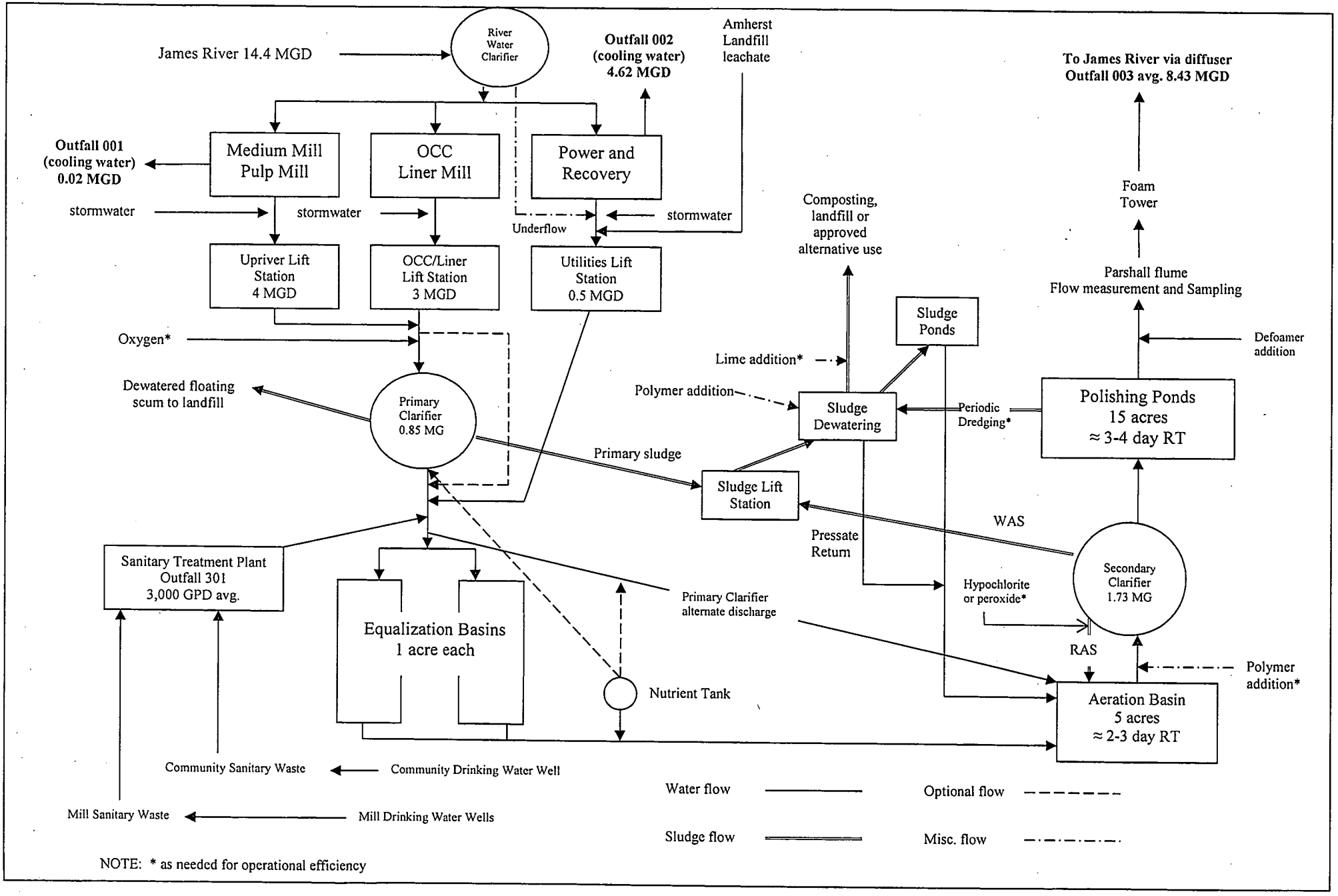
Maps and Diagrams

- Water Flow Diagram
- Wastewater/ Sludge Flow Diagram
- Outfall Location Maps
- Topographic Map

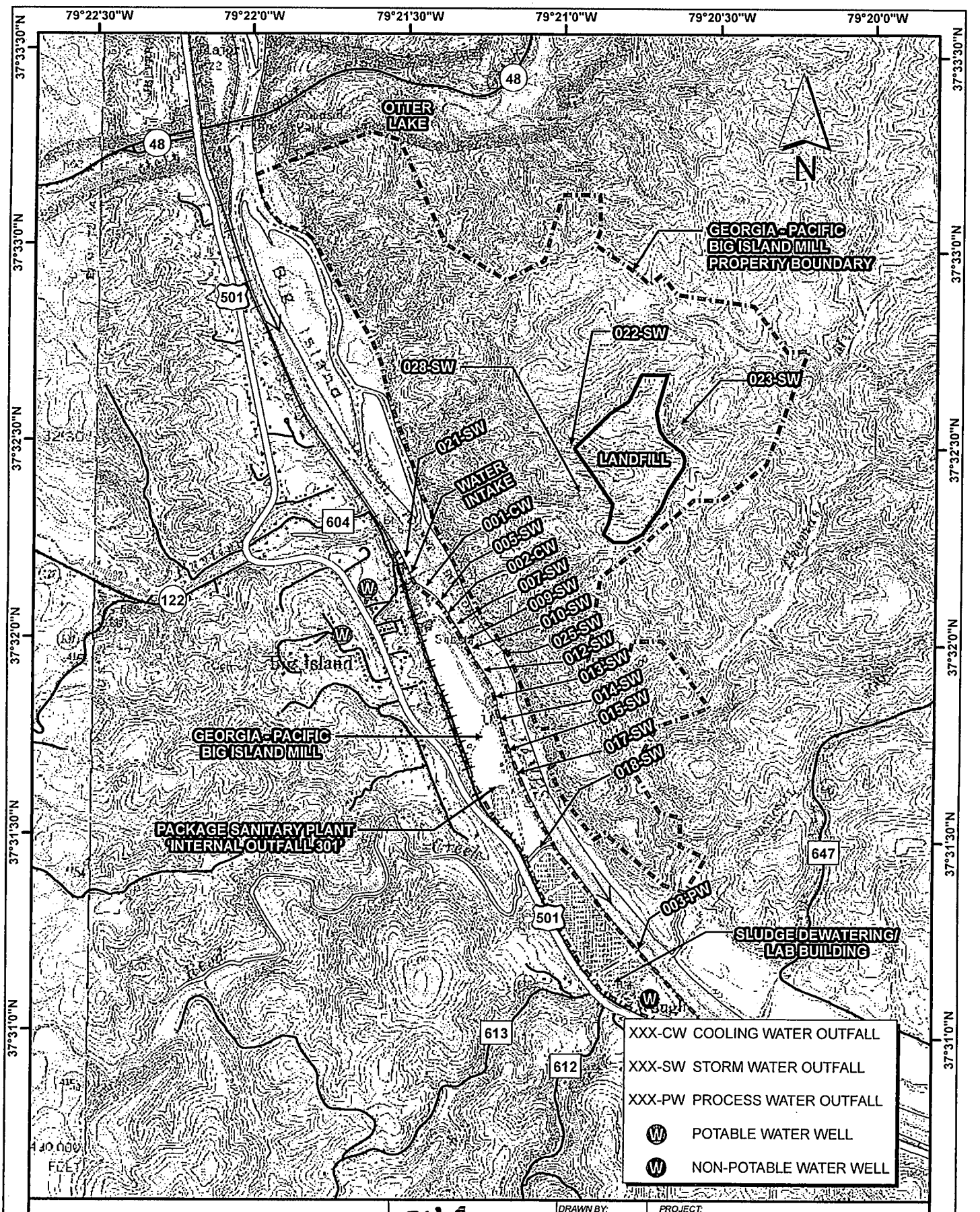
STORMWATER SITE PLAN
SHEET 5
SLUDGE PRESS & SLUDGE PONDS



Attachment A to Form 2C
GP Big Island, LLC
Water Flow Diagram



NOTE: * as needed for operational efficiency



IF THIS DRAWING IS A REDUCTION GRAPHIC SCALE MUST BE USED

U.S. Geological Survey. 1:24,000. 7.5 Minute Series

2,000 0 2,000 Feet

WW ENGINEERS SURVEYORS PLANNERS ASSOCIATES

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www.wwassociates.net

DRAWN BY: CLP	PROJECT: GEORGIA - PACIFIC BIG ISLAND PAPER MILL		
REVIEWED BY: HFW			
FILE NAME: USGSMap.mxd	TITLE: FIGURE 1-1 GP ~ OUTFALLS		
PROJECT NUMBER: 209078.00	Scale: 1" = 2,000 FT	Date: 11/17/09	Figure: 3 - 1

Attachment C

Facility Information

- **Site Inspection Report**
- **Chemical Storage Information**

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Inspection Report for GP Big Island
Reissuance of VPDES Permit No. VA0003026

TO: Permit File

FROM: Becky L. France, Water Permit Writer

DATE: September 19, 2014 (Revised February 8, 2015)

On September 18, 2014, site visit was conducted of the wastewater works at GP Big Island. Tim Pierce, Environmental Manager was present at the inspection. GP Big Island produces unbleached rolls of corrugated medium and linerboard. Hardwood chips and secondary fiber are used to manufacture the paper rolls. Secondary fiber (recycled waste paper) consists of old corrugated containers (OCC), mixed office waste (MOW), and double lined kraft clippings (DLK). To make paper the fibers are broken down into pulp. Wood chips are broken down using the semichemical process and waste paper is broken down by hydropulping.

The facility has its own power and steam generators, black liquor recovery system, and water treatment system. Spent black liquor is combusted in a chemical furnace to recover molten sodium carbonate which is redissolved in water to produce new pulping liquor.

Sewage Treatment Facility

Sanitary wastewater from the mill employees and approximately 25 residences in the community of Big Island is treated in a 40,000 gpd activated sludge package treatment plant. The treatment system consists of an inlet bar screen, comminutor, surge tank, diffused air aeration basin, clarifier, 8,000-gallon aerated sludge holding basin, tablet chlorinator, baffled chlorine contact tank, and v-notched weir with an ultrasonic flow meter.

Industrial Wastewater Treatment

The industrial treatment system works consists of three lift stations, a primary clarifier, two equalization basins, an aeration basin, secondary clarifier, polishing pond, Parshall flume, foam tower, diffuser, and sludge handling facilities. Process wastewater; contaminated stormwater from the woodyard areas, coal storage areas, and various chemical storage areas and process areas; and noncontact cooling water are treated by this system.

Primary Clarifier

Process wastewater from the OCC recycled facility, pulp mill, and Nos. 1, 3, and 4 paper machines is pumped via lift stations to the primary clarifier. A scum arm deposits floating scum in a trough. The scum is conveyed to an inclined dewatering conveyor and then into a hopper which is manually removed for disposal at the mill's existing industrial landfill (Amherst Landfill). A wet well collects water removed from the scum, and this water is pumped back to the clarifier. Calcium nitrate may be added to control odor.

Equalization Basins

Wastewater flows via gravity from the primary clarifier and is pumped from the Main Lift Station into one of two equalization basins. The two equalization basins are each one-acre and have a total capacity of 6.8 million gallons. Aeration is utilized in each equalization basin as needed. The effluent from the power area bypasses the primary clarifier and also flows to these basins. The equalization basins treat primary clarifier effluent; raw wastewater from the powerhouse/recovery area; stormwater from the woodyard, and other process areas; and leachate from the mill's active landfill (Amherst Landfill). The effluent from the equalization basins discharges to the aeration basin. Nitrogen and phosphorus are added to the equalization basin effluent prior to mixing with the process wastewater at the inlet to the aeration basin. The nutrient feed rate is optimized to control excess nutrients in the effluent. At the time of the site visit, the equalization basins were covered with a sludge layer.

Aeration Basin and Secondary Clarifier

Wastewater from the equalization basin is discharged into the extended aeration basin. The aeration basin also receives pressate from the sludge press operations, decanted water from the sludge holding ponds, and leachate from the closed mill landfill (Bedford Landfill). The activated sludge basin covers approximately 5 acres and has a capacity of 20 million gallons. Air is supplied by surface aerators. At the time of the site visit, the aeration basin had a chocolate color with some solids on top. The effluent from the aeration basin flows into a concrete wet well, housing three pumps. The pumps lift the effluent into the above ground secondary clarifier. Sludge is concentrated to approximately 1 to 2 percent solids concentration in the clarifier and then metered to the head of the aeration basin or taken to the sludge dewatering facility as required. Overflow from the secondary clarifier gravity flows to the polishing pond.

Polishing Pond

The 15-acre polishing pond has two floating plastic curtains in the pond to prevent short-circuiting. The polishing pond is periodically dredged and the sludge will be pumped to the sludge lift station or dewatered with portable presses.

A water-based defoamer may be added to the effluent before discharge. Effluent from the polishing pond is discharged through a Parshall flume to a foam tank. The effluent discharges to a 17 port diffuser that extends into the James River (outfall 003). There was no observed color in the receiving stream.

Industrial Sludge

Settled solids from the primary and secondary clarifiers are handled by the sludge dewatering system. Equalization basin sludge and dredged solids from the polishing pond are handled with portable presses or other means. The mill's sludge dewatering system includes a sludge press and gravity thickener.

A sludge lift station delivers the sludge to two 100,000-gallon agitated sludge holding tanks. Sludge from the tank is fed to the belt press. A comminutor shreds solids using a rotary cutter inside a screen basket. Polymer is injected into the sludge line after the sludge feed pump to promote flocculation. Then the sludge is pumped to a gravity thickener where the sludge is ridged and furrowed by a series of plow blades placed along the travel of the belt, allowing the water released from the sludge to pass through the belt. The gravity thickener is followed by a belt press where the water is pressed/removed from the sludge. Decanted liquid from the sludge dewatering system is collected in a sump and routed to the aeration basin.

Sludge solids drop onto a conveyor and lime may be added prior to falling into a concrete bunker. This industrial sludge is currently landfilled or hauled offsite to a composting operation. The site also has two sludge dewatering

lagoons that are only used during maintenance activities and emergencies. The lagoons each have a decant pump which returns the supernatant to the head of the aeration basin. Dried sludge is excavated and transferred to the onsite landfill on an as needed basis.

Sewage Sludge

For sewage sludge there is an 8,000-gallon sludge holding tank. A septic tank hauler transports the contents of this tank approximately 12 times per year. Sewage sludge is disposed of at the City of Lynchburg WWTP.

Outfalls

There are 17 outfalls associated with this facility. Fourteen of these outfalls are associated with stormwater only. Outfalls 001 and 002 consist of noncontact cooling water. At the time of the site visit there was a discharge from outfall 001. The permittee's application indicates that outfall 001 has been eliminated.

Outfall 003 is primarily process wastewater with some noncontact cooling water and contaminated stormwater. Outfall 301 discharges treated sanitary wastewater to outfall 003.

GP Big Island is currently operating Phase III of their Amherst landfill. This landfill may receive waste from the industrial wastewater treatment system. The sediment basin for this section drains to outfall 028.

Table 3-1

Chemical Unloading Areas

Process Area	Unloading Area	Delivery By	Chemical/Material	Spill Containment/Disposal
Recovery	Rail siding	Rail Car	Soda Ash	Area slopes toward trench which drains to process sewer and WWTP.
Recovery	Recovery Area Tanks at Courtyard	Truck	Caustic, Soda Ash	Concrete pad, area slopes toward trench which drains to process sewer and WWTP.
Power House - Water Treatment	Courtyard outside NE corner of Water Treatment Plant	Truck (totes or multi-compartment bulk)	Caustic, Boiler Water Treatment, Defoamer, Polymer, Salt, Alum	Paved area, slopes towards process sewer and WWTP.
Medium Mill	No. 3 Paper Machine Courtyard	Truck (totes or bulk)	Detergent or Caustic based cleaners, Defoamer, Oil, Defoamer, Feltwash	Paved area, slopes towards process sewer and WWTP.
Linerboard Mill	Additive unloading alleyway and south end of No. 4 PM basement	Truck (totes or bulk)	Detergent or Caustic based cleaner, Biocide, Defoamer, Shade control, Polymer, Alum, Starch, Sizing, Antiskid	Paved area, slopes towards process sewer and WWTP.
Wastewater Treatment	Primary Clarifier	Truck (bulk)	Nitrogen/Phosphorus Blend (Nutrient)	Area is contained. Stormwater is pumped to WWTP.
Wastewater Treatment	Sludge Press	Truck (bulk)	Polymer	Concrete pad drains to process sewer and WWTP.

Table 3-2

Outside Storage Tanks

Process Area	Tank	Contents	Volume Gallons	Containment Drainage
Pulp Mill	Propane	Liquified Propane	1000 ea (2 tanks)	NA
Medium Mill	Felt Cleaner	Presstige 9050	6,400	Concrete containment pad. Area drains to process sewer & WWTP
Medium Mill	High Density (HD) Pulp Tank	Paper Stock	581,668	Concrete containment pad. Area drains to process sewer & WWTP
Medium Mill	Sweco	Paper Stock		Area drains to process sewer and WWTP
Medium Mill	Warm Water	Warm Water		Area drains to process sewer and WWTP
Medium Mill	Used Oil	Used Oil	1,000	Tank is contained
Water Treatment	Alum Tank	48.5% Alum	8,000	Tank is contained
Water Treatment	Boiler Condensate	Boiler Condensate	15,040	Area drains to process sewer and WWTP
Water Treatment	Salt Tank	Salt	8,500	Area drains to process sewer and WWTP
Water Treatment	Caustic Tank	Sodium hydroxide	7,530	Area drains to process sewer and WWTP
Recovery	Kerosene Tank	Kerosene	300	Area drains to process sewer and WWTP
Recovery	Sodium Carbonate (3)	Sodim Carbonate	39,657 ea	Area drains to process sewer and WWTP
Recovery	Strong Black Liquor	Strong black liquor	100,000	Area drains to process sewer and WWTP
Recovery	Green Liquor	Green Liquor	150,000	Area drains to process sewer and WWTP
Recovery	Swing Tank	Weak black liquor or green liquor	150,000	Area drains to process sewer and WWTP
Recovery	Surge Tank	Weak black liquor	16,919	Area drains to process sewer and WWTP
Recovery	Rec. Boiler Area Tanks (4)	Black liquor or green liquor	6,750 to 90,000	Area drains to process sewer and WWTP
Recovery	Finished Liquor Tank	White liquor	174,000	Area drains to process sewer and WWTP
Woodyard	Diesel fuel tank	Diesel fuel	4,000	Double walled tank with curbing
Woodyard	Gasoline Tank	Gasoline	1,000	Double walled tank with curbing
Linerboard Mill	Dump Chest	Paper Stock	177,732	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Caustic Tank	Sodim hydroxide	13,535	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Alum Tank	Alum 48.5%	13,535	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Size	Prequel 500	6,400	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Broke	Paper Stock	155,600	Tank is loacted within concrete containment. Area drains to WWTP

Table 3-2

Outside Storage Tanks

Process Area	Tank	Contents	Volume Gallons	Containment Drainage
Linerboard Mill	High Density (HD) Pulp Tank	Paper Stock	667,071	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Low Density storage chest	Paper Stock	45,494	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Whitewater	Dilute stock solution	154,171	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Propane	Liquified Propane	1000 ea (2 tanks)	N/A
Linerboard Mill	Kerosene Tank	Kerosene	250	Tank is contained and area drains to stormwater sewer
Linerboard Mill	Starch Silo	Starch		Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Size	Prequel 2000	10000	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Hercobond Tank	Chemical Additive	18722	Tank is loacted within concrete containment. Area drains to WWTP
Linerboard Mill	Fire Tank	Mill Water		Area drains to stormwater sewer
Tank Farm	Weak Black Liquor	weak black Liquor	588,000	Tank is located within an earthern berm
Tank Farm	Weak Black Liquor (2)	Weak black liquor	900,000	Tank is located within an earthern berm
Tank Farm	Empty storage tank	N/A	125,000	Tank is located within an earthern berm
WWTP	Nutrient	Urea-phosphoric Acid	6,000	Tank is located within concrete containment.
WWTP	Primary Clarifier	Industrial Wastewater	853,000	Area drains to stormwater sewer
WWTP	Propane Tank	Liquified propane	500	N/A
WWTP	Secondary Clarifier	Industrial Wastewater	1,700,000	Area drains to WWTP and stormwater
WWTP	Sludge Tanks (2)	Industrial Wastewater Sludge	100,000 ea	Tank equipped with high level interlocks. Area drains to stormwater
WWTP	Lime Silo	Quicklime	50 tons	Tank equipped with high level interlocks. Area drains to WWTP
Amherst Landfill	Diesel Tank	Diesel fuel	2000	Double walled tank with curbing

Attachment D

Ambient Water Quality Evaluations

- **2012 Impaired Waters Summary (Excerpt)**
- **Upper James River Water Quality Management Plan (Excerpt)**
- **VDH Memorandums Regarding *Klebsiella Pneumoniae***
- **Endangered Species Information**

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

2012 Impaired Waters

Categories 4 and 5

James River Basin

Cause Group Code: **H01R-01-BAC** **Reed Creek**

Location: The upper limit is the headwaters in the Jefferson National Forest on the Sedalia Quad (intersection of State Routes 638 and 764). The impairment ends at the mouth of Reed Creek on the James River below Big Island, Virginia (Snowden, Sedalia and Big Island Quads).

City / County: Bedford Co.

Use(s): Recreation

Cause(s) /
VA Category: Escherichia coli/ 4A

The Reed Creek Bacteria TMDL Load Duration Study received U.S. EPA approval on 6/21/2004 [Fed. ID. 7763 / 21565] and SWCB approval on 12/02/2004 for these 1998 303(d) Listed waters for fecal coliform bacteria (formerly 2002 thru 2006 VAW-H01R-01). Escherichia coli (E.coli) replaces fecal coliform (FC) bacteria as the indicator as per Water Quality Standards [9 VAC 25-260-170. Bacteria; other waters].

Three stations are located within the 8.37 mile impaired waters (NHD mileage correction from 2002 Listing 12.27 miles). 2-RED000.16 (Off Route 501), the original listing station, and two additional stations 2-RED005.36 (Route 637 Bridge) and 2-RED008.32 (Route 122 Bridge). Please note there are no additional data beyond the 2008 Data Window of 2001 to 2006.

2-RED008.22- (Rt. 122 Bridge) 2012 results are one (1300 cfu/100 ml) of three samples in excess of the instantaneous criterion. The 2010 IR finds four of 14 E.coli samples exceed the 235 cfu/100 ml WQS instantaneous criterion. Values in excess of the criterion range from 350 to 1300 cfu/100 ml. 2008 IR reports five of 17 E.coli samples exceed. Values in excess of the criterion range the same as 2010.

2-RED005.36- (Rt. 637 Bridge) Three of three samples exceed the instantaneous criterion within the 2012 Data Window. 2010 E.coli exceedances of the instantaneous criterion are found in 10 of 14 samples. Values exceeding the criterion range from 260 to >2000 cfu/100 ml. 2008 IR finds E.coli exceedances in 12 of 17 samples where exceeding values range from 280 to 2000 cfu/100 ml.

2-RED000.16- (Off Rt. 501) E.coli data within the 2012 Data Window produce two of 12 excursions of the 235 cfu/100 ml instantaneous criterion. Seven of 33 E.coli samples exceed the instantaneous criterion within the 2010 data window. Excessive values range from 250 to 500 cfu/100 ml. 2008 results in eight of 38 E.coli samples exceeding the instantaneous criterion and the same range as 2010.

Reed Creek **Recreation**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Escherichia coli - Total Impaired Size by Water Type:			**8.37**

Sources:

- Livestock (Grazing or Feeding Operations)
- On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
- Unspecified Domestic Waste
- Wastes from Pets
- Wildlife Other than Waterfowl

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

2012 Impaired Waters

Categories 4 and 5

James River Basin

Cause Group Code: **H01R-01-HG** **James River**

Location: James River from Balcony Falls Dam downstream to Holcomb Rock Dam

City / County: Amherst Co. Bedford Co. Rockbridge Co.

Use(s): Fish Consumption

Cause(s) /
VA Category: Mercury in Fish Tissue/ 5A

This initial 2010 303(d) Listing is based on 2005 fish tissue collections and new Water Quality Standards effective 2/01/2010. Mercury (Hg) exceedances of the DEQ 0.3 parts per million (ppm) tissue value cause impairment of the Fish Consumption Use. No VDH Fish Consumption or Drinking Water Advisories are issued for mercury for these waters. The Virginia Department of Health (VDH) level of concern is 0.5 ppm. Please visit http://www.deq.virginia.gov/info/mercury.html for more information about mercury contamination and http://www.vdh.virginia.gov/Epidemiology/dee/PublicHealthToxicology/Advisories/ for VDH Advisories or Bans.

2-JMS279.41 (Blue Ridge Parkway Bridge) - The initial 2010 303(d) Listing is based on 2005 fish tissue analysis where mercury (Hg) is found in two species; smallmouth bass at 0.46 ppm and largemouth bass at 0.40 ppm; each in excess of the new WQS TV based 0.3 ppm. There are no additional data within the 2012 data window.

James River **Fish Consumption**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Mercury in Fish Tissue - Total Impaired Size by Water Type:			**15.55**

Sources:

Source Unknown

2012 Impaired Waters

Categories 4 and 5

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

James River Basin

Cause Group Code: **H03R-04-PCB** **James River**

Location: The James River from Big Island dam (below Blue Ridge Parkway) downstream to the I-95 bridge James River Bridge in Richmond including its tributaries Hardware River up to Rt. 6 bridge and Slate River up the Rt. 676 bridge.

City / County: Amherst Co. Bedford Co.

Use(s): Fish Consumption

Cause(s) /
VA Category: PCB in Fish Tissue/ 5A

The rivers are considered impaired of the Fish Consumption Use due to a VDH fish consumption restriction for PCBs. No more than two meals/month of gizzard shad, carp, American eel, flathead catfish, or quillback carpsucker are recommended.
Visit the VDH website for more details:
http://www.vdh.state.va.us/HHControl/fishingadvisories.asp

A portion of the segment was first listed in the 2004 segment but was expanded during the 2006 cycle based on the current condemnation (12/13/2004). The original 2016 TMDL due date was maintained.

The impairment is based on the results of DEQ's fish tissue monitoring program which indicated PCB exceedances at multiple stations including 2-JMS157.28, 2BJMS118.99, 2-JMS127.50, 2CJMS110.00 and 2-JMS258.54 with PCBs in 4 Species, 2-JMS213.00 (2005 FT/Sediment) with PCBs in 3 Species and 2-JMS176.63 (2005 FT/Sediment) with PCBs in 2 Species.

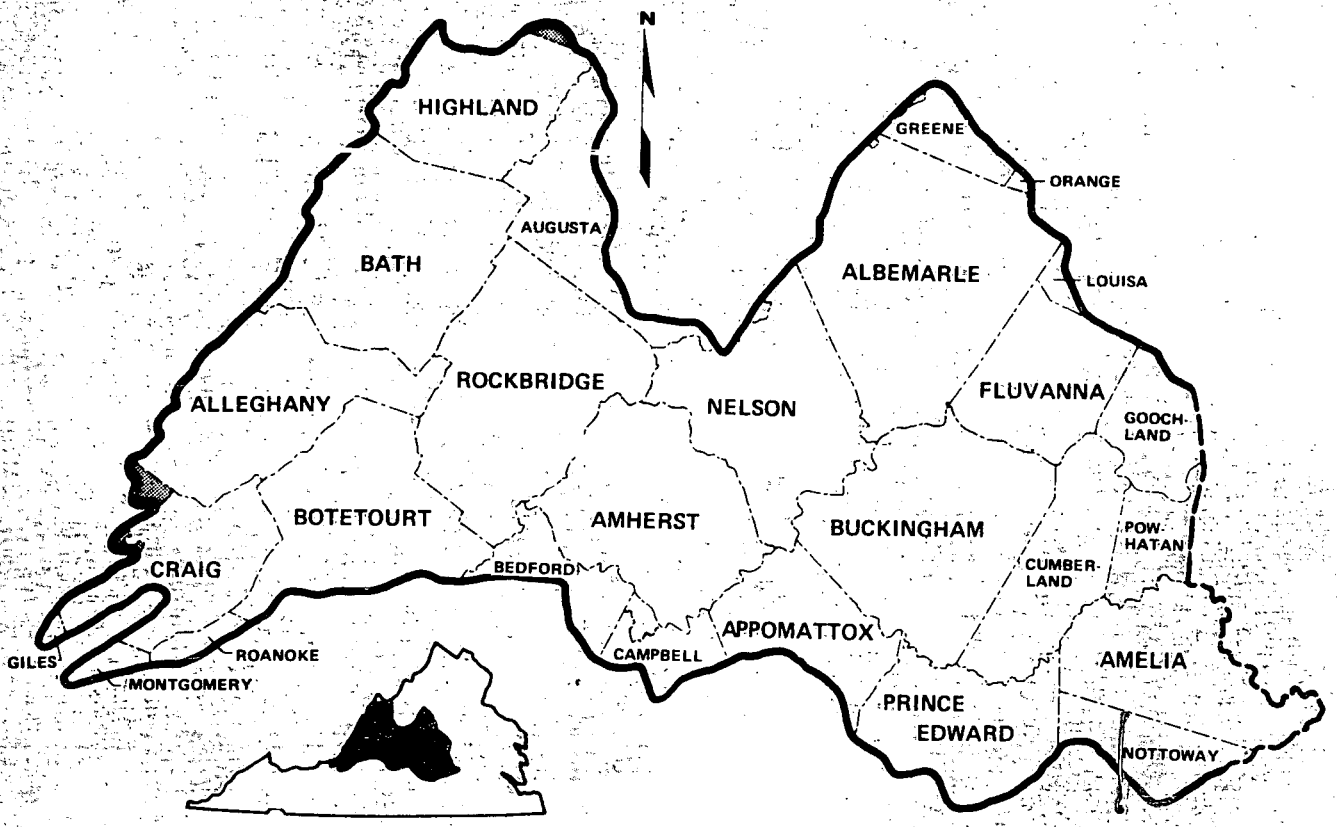
James River **Fish Consumption**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
PCB in Fish Tissue - Total Impaired Size by Water Type:			**6.36**

Sources:

Source Unknown

VIRGINIA STATE WATER CONTROL BOARD

UPPER JAMES RIVER BASIN



COMPREHENSIVE WATER RESOURCES PLAN

VOLUME V-A

PART 1 OF 3

SUMMARY REPORT

WATER QUALITY MANAGEMENT PLAN

PLANNING BULLETIN 217-C

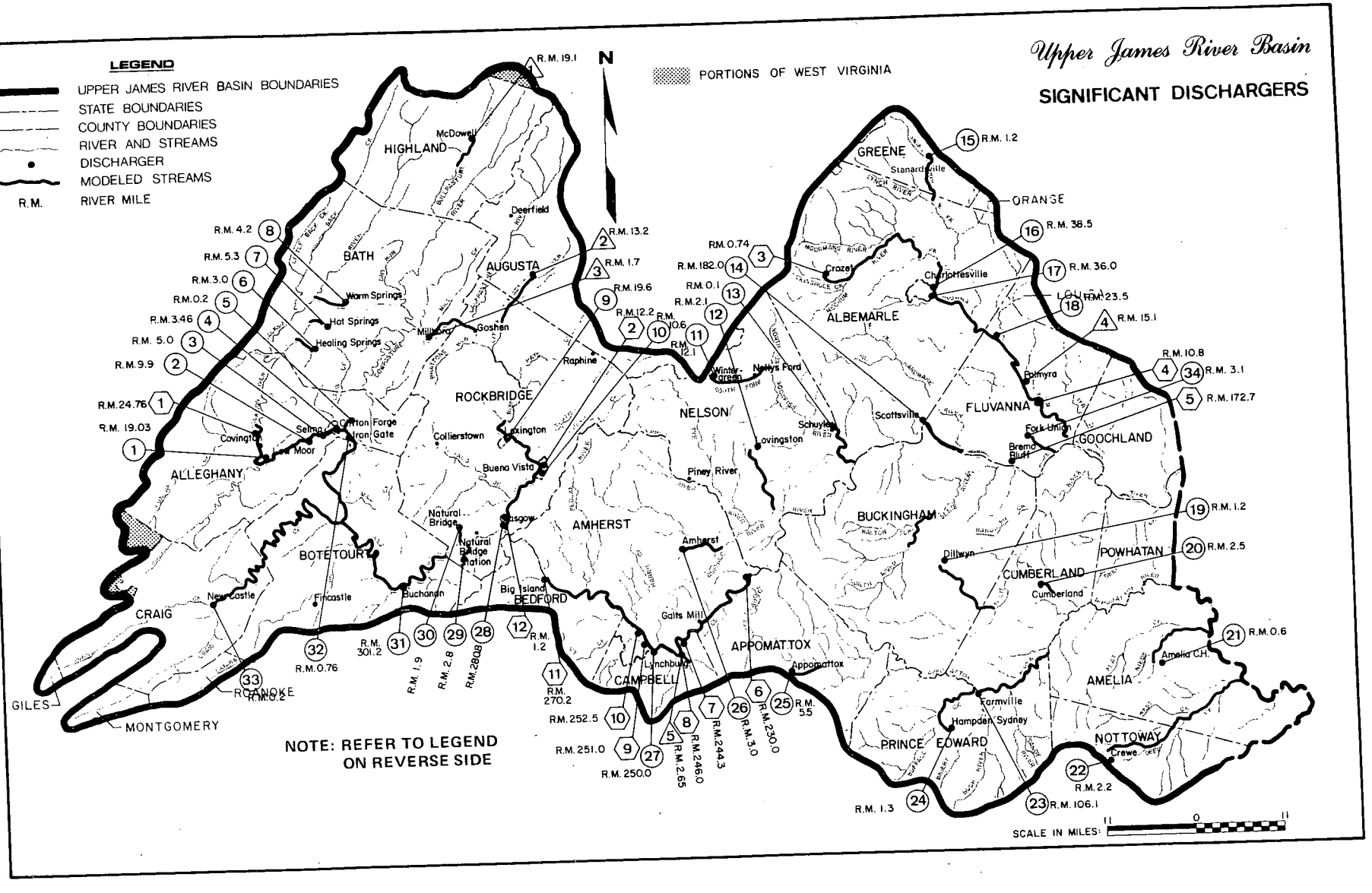
1976

PREPARED FOR THE

VIRGINIA STATE WATER CONTROL BOARD

BY

WILEY AND WILSON, INC



SOURCE: WILEY & WILSON, INC.

PLATE NO. 2

Table 1

(Legend for Plate 2)
Significant Dischargers

⬡ Significant Industrial Dischargers

1. Westvaco*
2. Georgia-Bonded Fibers, Inc.*
3. Morton Frozen Foods*
4. Schwarzenbach Huber
5. Bremo Bluff VEPCO
6. Virginia Fibre, Inc.
7. Babcock & Wilcox, Inc.
8. Lynchburg Foundry (Archer Creek Plant)
9. Lynchburg Foundry (Lynchburg Plant)
10. Glamorgan
11. Owens-Illinois
12. Burlington Industries (Lees Carpets)*

△ Potential Significant Municipal Dischargers

1. McDowell
2. Craigsville
3. Millboro
4. Palmyra
5. Concord

○ Significant Municipal Dischargers**

1. Covington STP
2. Low Moor STP*
3. Selma STP*
4. Clifton Forge STP*
5. Cliftondale Park STP*
6. Ashwood-Healing Springs STP*
7. Hot Springs STP
8. Warm Springs STP*
9. Lexington STP
10. Buena Vista STP*
11. Wintergreen STP
12. Lovingston STP*
13. Schuyler STP
14. Scottsville STP
15. Stanardsville STP*
16. Charlottesville - Meadow Creek STP*
17. Charlottesville - Moores Creek STP*
18. Lake Monticello STP
19. Dillwyn STP*
20. Cumberland High School STP*
21. Amelia Sanitary District*
22. Crewe STP*
23. Farmville Lagoons*
24. Hampden-Sydney College STP*
25. Appomattox Lagoon*
26. Amherst STP*
27. Lynchburg STP*
28. Glasgow STP*
29. Natural Bridge Camp for Boys STP
30. Natural Bridge STP
31. Buchanan STP
32. Iron Gate STP*
33. New Castle STP*
34. Fork Union Military Academy

*Continuing Planning "Significant" Dischargers

**Recent investigations have shown that Mallow-Altamont can be considered as a significant discharge to the Jackson River which was apparently not included in this water quality analysis. However, this discharge should be integrated into the future planning process.

9 VAC 25-720-60. James River Basin.

A. Total maximum daily load (TMDLs).

TMDL #	Stream Name	TMDL Title	City/ County	WBID	Pollutant	WLA	Units
1.	Pheasanty Run	Benthic TMDL Reports for Six Impaired Stream Segments in the Potomac-Shenandoah and James River Basins	Bath	I14R	Organic Solids	1,231.00	LB/YR
2.	Wallace Mill Stream	Benthic TMDL Reports for Six Impaired Stream Segments in the Potomac-Shenandoah and James River Basins	Augusta	I32R	Organic Solids	2,814.00	LB/YR
3.	Montebello Sp. Branch	Benthic TMDL Reports for Six Impaired Stream Segments in the Potomac-Shenandoah and James River Basins	Nelson	H09R	Organic Solids	37.00	LB/YR
4.	Unnamed Tributary to Deep Creek	General Standard Total Maximum Daily Load For Unnamed Tributary to Deep Creek	Nottoway	J11R	Raw Sewage	0	GAL/YR
5.	Unnamed Tributary to Chickahominy River	Total Maxiumum Daily Load (TMDL) Development for the Unnamed Tributary to the Chickahominy River	Hanover	G05R	Total Phosphorus	409.35	LB/YR

B. Stream segment classifications, effluent limitations including water quality based effluent limitations, and waste load allocations.

TABLE B1 - UPPER JAMES RIVER BASIN RECOMMENDED SEGMENT CLASSIFICATION

Stream Name	Segment No.	Mile to Mile	Classification	Comments
Maury River	2-4	80.3-0.0	E.L.	Main & tributaries
James River	2-5	271.5-266.0	W.Q.	Main only
James River	2-6	266.0-115.0	E.L.	Main & tributaries except Tye & Rivanna River
Tye River	2-7	41.7-0.0	E.L.	Main & tributaries except Rutledge Creek
Rutledge Creek	2-8	3.0-0.0	W.Q.	Main only
Piney River	2-9	20.6-0.0	E.L.	Main & tributaries
Rivanna River	2-10	20.0-0.0	E.L.	Main & tributaries
Rivanna River	2-11	38.1-20.0	W.Q.	Main only
Rivanna River	2-12	76.7-38.1	E.L.	Main & tributaries
S.F. Rivanna River	2-13	12.2-0.0	E.L.	Main & tributaries
Mechum River	2-14	23.1-0.0	E.L.	Main & tributaries
N.F. Rivanna River	2-15	17.0-0.0	E.L.	Main & tributaries except Standardsville Run
Standardsville Run	2-16	1.2-0.0	W.Q.	Main only
Appomattox River	2-17	156.2-27.7	E.L.	Main & tributaries except Buffalo Creek, Courthouse Branch, and Deep Creek
Buffalo Creek	2-18	20.9-0.0	E.L.	Main & tributaries except Unnamed Tributary @ R.M. 9.3
Unnamed Tributary of Buffalo Creek @ R.M. 9.3	2-19	1.3-0.0	W.Q.	Main only
Courthouse Branch	2-20	0.6-0.0	W.Q.	Main only
Deep Creek	2-21	29.5-0.0	E.L.	Main & tributaries except Unnamed Tributary @ R.M. 25.0
Unnamed Tributary of Deep Creek @ R.M. 25.0	2-22	2.2-0.0	W.Q.	Main only

TABLE B2 - UPPER JAMES RIVER BASIN LOAD ALLOCATIONS BASED ON EXISTING DISCHARGE POINT7

Stream Name	Segment Number	Classification	Mile to Mile	Significant Discharges	Total Assimilative Capacity of Stream BOD5 lbs/day	Wasteload Allocation BOD5 lbs/day2	Reserve BOD5 lbs/day5
Cedar Creek	2-3	E.L.	1.9-0.0	Natural Bridge, Inc. STP	35.0	28.0	7.0 (20%)
Elk Creek	2-3	E.L.	2.8-0.0	Natural Bridge Camp for Boys STP	7.0	3.3	3.7 (53%)
Little Calfpasture River	2-4	E.L.	10.9-4.0	Craigsville	12.0	9.6	2.4 (20%)
Cabin River	2-4	E.L.	1.7-0.0	Millboro	Self -sustaining	None	None
Maury River	2-4	E.L.	19.6-12.2	Lexington STP	380.0	380.0	None
Maury River	2-4	E.L.	12.2-1.2	Georgia Bonded Fibers	760.0	102.03	238.0 (31%)
				Buena Vista STP		420.0	
Maury River	2-4	E.L.	1.2-0.0	Lees Carpets	790.0	425.03	290.0 (37%)
				Glasgow STP		75.0	
James River	2-5	W.Q.	271.5-266.0	~~Owens-Illinois~~ GP Big Island	4,640.0	4,640.03	None
James River	2-6	E.L.	257.5-231.0	Lynchburg STP	10,100.0	8,000.0	2,060.0 (20%)
				Babcock & Wilcox- NNFD		40.03	
James River	2-6	E.L.	231.0-202.0	Virginia Fibre	3,500.0	3,500.0	None
Rutledge Creek	2-8	W.Q.	3.0-0.0	Amherst STP	46.0	37.0	9.0 (20%)
Town Creek	2-7	E.L.	2.1-0.0	Lovington STP	26.0	21.0	5.0 (20%)
Ivy Creek	2-6	E.L.	0.1-0.0	Schuyler	13.8	11.0	2.8 (20%)
James River	2-6	E.L.	186.0-179.0	Uniroyal, Inc.	1,400.0	19.36	1,336.0 (95%)
				Scottsville STP		45.0	
North Creek	2-6	E.L.	3.1-0.0	Fork Union STP	31.0	25.0	6.0 (20%)
Howells Branch and Licking Hole Creek	2-14	E.L.	0.7-0.0	Morton Frozen Foods	20.0	20.03	None
Standardsville Run	2-16	W.Q.	1.2-0.0	Standardsville STP	17.9	14.3	3.6 (20%)
Rivanna River	2-11	W.Q.	23.5-20.0	Lake Monticello STP	480.0	380.0	100.0 (20%)
Rivanna River	2-10	E.L.	15.0-0.0	Palmyra	250.0	4.0	158.0 (63%)

F. ASSIGNMENT OF EFFLUENT LIMITS TO ALL SIGNIFICANT POINT SOURCES AND ESTABLISHMENT OF COMPLIANCE SCHEDULES AND TARGET ABATEMENT DATES

This section lists the maximum allowable loads for individual significant dischargers. Two tables are used to present these values. Table 76, "Load Allocations Based on Existing Discharge Point," lists the waste load allocations determined for dischargers based on the criteria that the existing discharge point is used or, if there is currently no treatment facility, the stream presently receiving the runoff is used. During the development of alternative treatment systems and the subsequent selection of the recommended plan, the point of discharge is recommended for relocation or elimination (in the case of land application of secondary effluent) in several cases. Table 77, "Additional Load Allocations Based on Recommended Discharge Point," lists the cases where this occurs.

The tables provide a list of the significant dischargers which primarily discharge biochemical oxygen demanding substances. The total assimilative capacity of the stream segment is shown in terms of five-day biochemical oxygen demand (BOD_5). The receiving stream, its recommended segment classification and number, and the stream limits for which the total assimilative capacity is valid are shown in the tables. Another important item in the table is the waste load allocations for a given significant discharger. This allocation is based either on 80 percent of the total assimilative capacity of the stream or on the year 2020 projected BOD_5 load, whichever is less. The reserve column of the tables indicate the amount of BOD_5 load that is being held in reserve to allow for future growth and modeling accuracy. The percentages of reserve noted are based on the total assimilative capacity of the stream and readily indicate if the full load allocation of a segment is being allotted to the significant discharger. This occurs when the reserve is equal to 20 percent.

Although noted elsewhere in this study, the criteria used in determining the total assimilative capacity (maximum allowable load) of a stream will be repeated here for completeness. For Water Quality (W.Q.) segments, the criteria of minimum daily average dissolved oxygen content, as given in the Water Quality Standards for a given class stream, is used. The criteria of the SWCB's policy of maintenance of high water quality is used in determining the total assimilative capacity for Effluent Limitation (E.L.) segments.

The establishment of compliance schedules and target abatement dates for significant municipal point sources is contained in Chapter VI, Section B of this study. To prevent repetition within the study, they are not included in this section.

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November 18, 1992

Mr. Garry T. Griffith
Environmental & Quality Control Supt.
Georgia–Pacific Corporation
P.O. Box 40
Big Island, VA 24526

Re: Report for Proposal #93-0131-07
Sponsor PO # 043012
FRS # 435156

Dear Garry:

This letter accompanies our final report which is dated 6 November 1992. The final report contains five pages of text, one figure, and five tables. Accompanying this final report is a notebook that contains nine tabbed sections; each section contains all data in table form that was submitted to you as part of the 10 interim reports sent to you during the project period.

Please let me know if you wish for us to add anything to the text of this report or if you wish to discuss any of the points made in our report.

We have enjoyed working with you and Marina on this project. Thank you for your support and kind assistance.

Sincerely,

Bill

G. William Claus, Ph.D.
Associate Professor of
Microbiology

enclosures

Copy sent to: B. Slagle
Va Fibre 3/94

REPORT

1992 BACTERIOLOGICAL INVESTIGATION OF JAMES RIVER SAMPLES TAKEN UPSTREAM, AT THE WASTE-TREATMENT OUTFALL, AND DOWNSTREAM FROM THE GEORGIA-PACIFIC CORPORATION BIG ISLAND MILL

G. William Claus and Joy Grant
Biology Department, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0406

6 November 1992

INTRODUCTION

The purpose of this study was to provide Georgia-Pacific Corporation with a bacteriological analysis of waste-water flowing from their treatment system into the James River and to compare that with similar bacteriological analyses of river water obtained from above and below the waste-water outfall.

METHODS

Sampling sites: Water samples were taken from three sampling sites: (1) in the James River upstream from the Georgia-Pacific Mill (at Big Island Dam); (2) at the outfall (003) from the Georgia-Pacific Corporation Big-Island Paper Mill waste-water treatment system; and (3) in the James River about five-miles downstream from the 003 waste-stream outfall (at Coleman Falls Dam).

Number and frequency of sampling: Duplicate samples were taken at each sampling site on 10 separate dates between 3 March 1992 and 21 July 1992.

Bacteriological analyses: Most Probable Number (MPN) values were determined for total coliforms and fecal coliforms. The MPN analyses were made at the 95% confidence limits according to the 17th edition of the *Standard Methods for the Analysis of Water and Waste water*, 1990, page 9-78. Five replicates were made from each dilution.

Total coliform analyses were determined by the number of dilutions that were positive for both the Presumptive Test (lauryl tryptose broth) and the Confirmed Test (brilliant green

lactose bile broth) as described in the *Standard Methods* manual. Details are given in the attached Procedures Flow Chart (Figure 1).

Fecal coliform analyses were determined by the number of dilutions that were positive in EC medium as described in the *Standard Methods* manual. Details are given in the attached Procedures Flow Chart (Figure 1).

Each time that one of the five EC broth replicates from one dilution exhibited a positive Fecal Coliform test , this culture was streaked on nutrient agar plates to isolate colonies (Nutrient Agar Plate - 1, Figure 1). Each isolated colony was re-streaked a second time to assure culture purity before conducting further tests. Once culture purity was determined, all of the colonies from each dilution series were described and given a letter designation. IMViC tests were then performed on each colony type from each dilution series according to the 1990 edition of the *Standard Methods* manual. Each colony type was also inoculated into an EC-broth tube (EC Broth - 2, Figure 1) to verify that this culture was positive for the fecal coliform reaction.

Once culture purity was assured, culture identification was made with the API-20E test system (Figure 1). Isolate identifications were made on only three of the sampling dates (14 April, 27 May, and 7 June 1992). An Analytical Profile Index number was derived from tests performed on each purified isolate, and a species identification was determined based upon data given in the *Analytical Profile Index of Enterobacteriaceae and other Gram-Negative Bacteria*, 9th edition, 1989.

RESULTS

Identification of colony types from positive fecal-coliform analyses: From each positive EC-broth tube (fecal coliform test) found from duplicate samples taken from the three sampling sites on 14 April, 27 May, and 7 June, we isolated 77 different cultures for identification. These 77 demonstrated only six different colony types. These were designated by letters (a, b, c, e, f, and h), and they are described in the attached Table 1. Even though six colony types were evident, 75 of the 77 colonies isolated were identified by API analyses as either *Escherichia coli* or *Klebsiellia pneumoniae*. Three colony types (b, c, and e) were identified as *E. coli* in 38 of the 41 times isolated. Two colony types (a and f) were identified as *K. pneumoniae* in 33 of the 34 times isolated. The reliability upon which these identifications matched our colony descriptions strongly suggested that we could search back through our descriptions of colony types and reliably predict whether these colony types were *E. coli* or *K. pneumoniae.*

Most probable numbers for *E. coli* and *K. pneumoniae*. We examined our data from each sample taken on each of the 10 sampling trips to determine how many times each colony type was isolated from each positive EC-broth tube (fecal coliform test). One example from such an analysis is shown in the attached Table 2. Here it may be seen that colony type a was isolated in four of the five replicate EC-broth tubes made from the first "dilution" (representing 1.0 ml), in three of the five replicate tubes from the next dilution (representing 0.1 ml), in four of the five replicates from the dilution representing 0.01 ml, and in none of the five replicates in each of the next four dilutions. We then applied the MPN rules given in the *Standard Methods* manual to determine the most probable number of either *E. coli* or *K. pneumoniae* in each sample.

Table 3 shows the most-probable number of API-identified *Escherichia coli* from all three collecting sites. Samples taken from Big Island Dam (upstream from the mill) contained from 3 to 60 *E. coli* per 100 ml of river water during this five-month sampling period. The waste stream outfall (003) contained from 150 to 17,000 *E. coli* per 100 ml , and samples taken from Coleman Falls Dam (about five miles downstream from the mill) contained from 6 to 260 *E. coli* per 100 ml of sample.

Table 4 shows the most-probable number of API-identified *Klebsiella pneumoniae* from all three collecting sites. Samples taken from Big Island Dam (upstream from the mill) contained from 3 to 26 *K. pneumoniae* per 100 ml of river water during this five-month sampling period. The waste stream outfall (003) contained from 170 to 80,850 *K. pneumoniae* per 100 ml , and samples taken from Coleman Falls Dam (about five miles downstream from the mill) contained from 7 to 153 *K. pneumoniae* per 100 ml of sample.

Effect of physical and chemical factors on fecal and total MPNs. Each time samples were taken at the three collection sites, measurements were made of temperature, flow rate, hydrogen-ion concentration, and biochemical oxygen demand (Table 5). This was done to see if there was correlation between these factors and the most-probable numbers for total and fecal coliforms. No such correlation was detected.

DISCUSSION

Colony types and identification of bacteria in positive fecal-coliform tests. When we first saw the variety of colony types isolated from the positive EC-broth tubes prepared from each sample (e.g. see the attached Table 2), we assumed that many different species of coliforms were contributing to the fecal- coliform numbers. However, we identified each colony type (isolate) using the API-20E System, and we found that all but two of the 77 isolates were either *Escherichia coli* or *Klebsiella pneumoniae.* This led us to conclude that

both the enteric bacterium *E. coli* and the non-enteric bacterium *K. pneumoniae* give a positive fecal coliform test using EC-Broth at 44.5 degrees C as recommended in the 1990 (17th) edition of *Standard Methods for the Examination of Water and Waste Water.*

Each time that *K. pneumoniae* was isolated from a positive EC-broth tube, this isolate was placed back into sterile EC-broth, and it gave a positive fecal-coliform reaction. Therefore, we are confident that many of the high fecal-coliform (MPN) determinations are caused by the presence of large numbers of *K. pneumoniae* in these samples.

We conclude that the fecal-coliform numbers present in the 003 outfall samples are elevated by the presence of large numbers of *K. pneumoniae* (see the appendices given in the notebook accompanying this report).

There are numerous reports in the literature showing that non-fecal *K. pneumoniae from* pulp- and paper-mill effluents frequently give positive fecal coliform tests.

Presence of *Klebsiella pneumoniae* in samples. Table 4 shows that almost all samples from the Mill-Process Outfall (003) contained far more *K. pneumoniae* than *E. coli.* Therefore, we conclude that the high fecal coliform numbers are caused by *K. pneumoniae* that are present in numbers that are from 5- to 40-times greater than *E. coli.*

It appears that the numbers of *K. pneumoniae* cells in 003 samples vary with the season. Samples taken on 17 March contained about 450-times more *K. pneumoniae* than samples taken on 7 July, and the numbers tended to decrease with time between March and July (Table 4). Since neither BOD, pH, nor flow rates steadily increased or decreased during this time (Table 5), we suspect that these factors did not influence *K. pneumoniae* numbers in the 003 outfall. On the other hand, *K. pneumoniae* numbers did appear to correlate with sample temperatures at the 003 outfall. Numbers appeared to be highest between 17 March and 4 June when temperatures varied from 13 to 24 degrees C. Between 4 June and 21 July, temperatures rose from 24 to almost 30 degrees C, and *K. pneumoniae* numbers decreased from 40,000 per 100 ml to about 200 per 100 m. Since these cells grow at 44.5 degrees C (see EC-broth test in Figure 1), these lower numbers at higher outfall temperatures probably do not reflect the influence of temperature on growth. Instead, we suspect that these cells do not survive as long in the ponds at these elevated temperatures.

We suspect that the higher *K. pneumoniae* numbers at the lower temperatures indicate greater survival of these non-enteric bacteria that are introduced from the plant effluent that contains large quantities of wood-processing wastes.

Presence of *Escherichia coli* in samples. Table 3 shows that there were far fewer *E. coli* in 003 Outfall samples than *K. pneumoniae*. On the other hand, the numbers of *E. coli* were usually higher than the 126 per 100 ml limit recommended by the 1986 EPA Quality Criteria for Water (Gold Book). The highest number of *E. coli* occurred in the 17 March samples. After that, the numbers varied only from about 150 to 1,100 per 100 mls of sample. Could it be that the 17,000 per 100 ml on 17 March represented high numbers remaining from when the town/mill sewage was being treated in these ponds? Could it be that continued use of the treatment system for pulp and paper wastes only will further reduce the numbers of *E. coli* in the Outfall? We suspect that this will happen, but that it will not be shown by doing the standard EC-medium-based MPN determination for fecal coliforms.

It seems likely to us that the *E. coli* in the 17 March 003 Outfall samples are those remaining from when town/mill domestic waste water was being added to this treatment system. Otherwise, where would the *E. coli* be coming from? It seems unlikely that the few animals living in or adjacent to the ponds could contribute significant coliform numbers. Could it be that the nutrients in the treatment ponds can support the growth of *E. coli* introduced by these animals? But, if that were true, we suspect that growth of *E. coli* would be more likely in the summer when temperatures were more favorable. Instead, *E. coli* numbers were lower in the summer (Table 3).

CONCLUSIONS SUPPORTED BY THE DATA:

- Non-enteric bacteria (*Klebsiella pneumoniae)* give a positive fecal-coliform test (growth in EC-broth at 44.5 degrees C within 24 hours).

- The high fecal coliform counts from the 003-Outfall samples are more reflective of *Klebsiella pneumoniae* numbers than *Escherichia coli* numbers.

- Numbers of *Escherichia coli* in the 003-Outfall samples dropped drastically after 17 March, and thereafter fluctuated between 150 and 1,100 per 100 ml during the next 5 months.

- Warmer (summer) temperatures in the treatment ponds favor a lower number of *Klebsiella pneumoniae* in the 003-Outfall samples.

Figure 1

PR(CEDURES FLOW CHA T

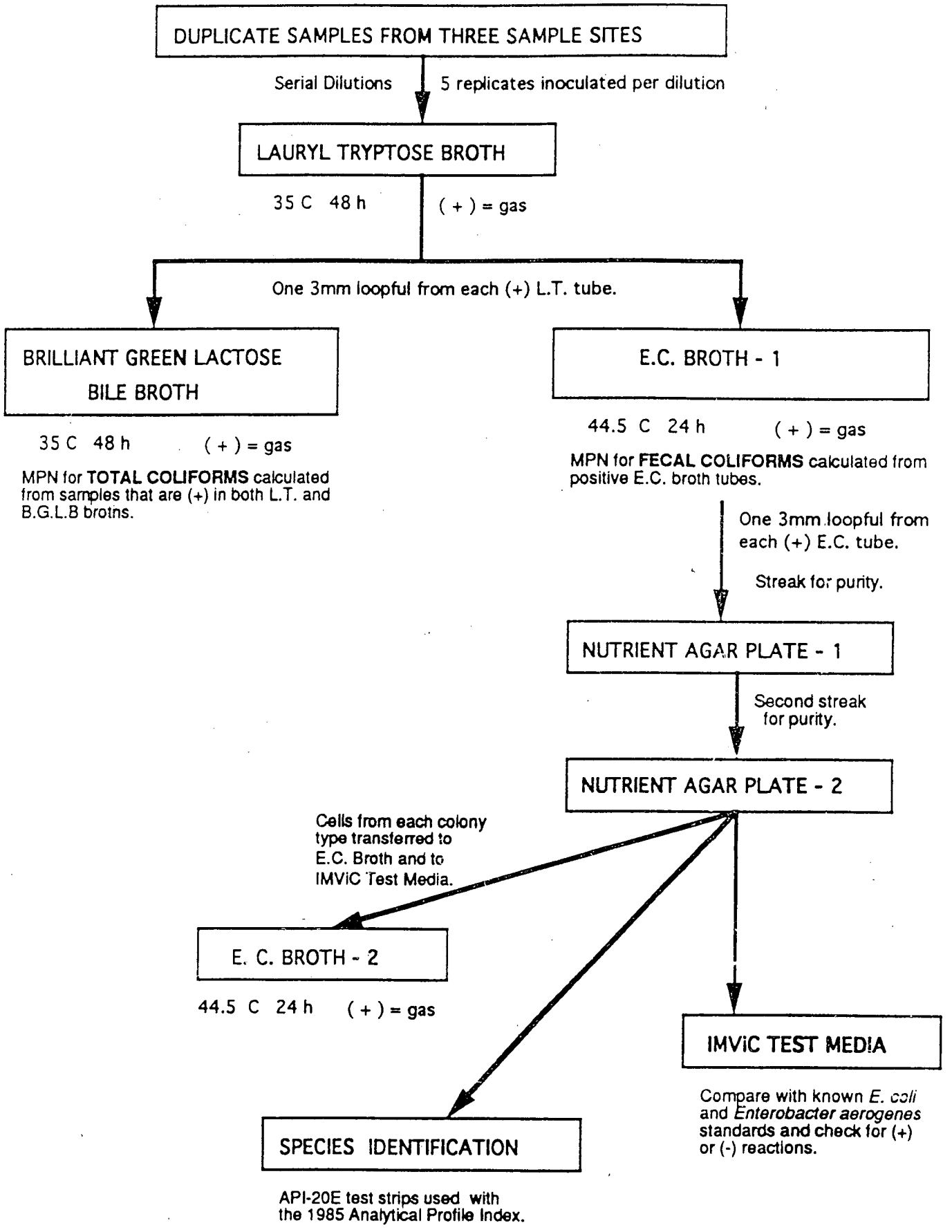


Table 1

IDENTIFICATION OF COLONY TYPES ISOLATED FROM GEORGIA PACIFIC SAMPLES

(revised 9 Oct 92)

Colony Type Isolated [a]	Number Selected for Identification				Number Identified As		
	14 Apr	27 May	7 Jun	TOTAL NUMBER IDENTIFIED [b]	*K. pneu.*[c]	*E. coli* [d]	Other
a	11	10	6	27	26	1	0
b	6	7	6	19	2	17	0
c	2	0	1	3	0	3	0
e	6	8	6	20	1	18	1
f	1	2	4	7	7	0	0
h	0	0	1	1	0	0	1

[a] **Colony types** observed on Nutrient-Agar streak plates inoculated from 24 h E.C. broth tubes. Description of colony types: **a** = 3-4.5 mm diam/shiny surface/domed shape/dense to transmitted light/smooth edge. **b** = 2-5.5 mm diam/dull surface/flat shape/thin with dense center when observed with transmitted light/most of colony is removed when touched. **c** = ca. 4 mm diam/raised shape/feathered edge. **e** = 3-4.5 mm diam/flat shape/concentric rings/smooth edge. **f** = 3.5-5.0 mm diam/domed shape/dense to transmitted light/smooth edge. **h** = 1.5-3.0 mm diam/shiny/domed/dense/yellow/smooth edge. Note that colony types were designated (letters assigned) after purification but before being applied to the API-20 Identification System.

[b] Purified bacteria were identified using the Analytical Profile Index (API-20E) system. Identification data exists as Tables in separate reports for each sampling date. Tables are entitled *Summary of IMViC Reactions, Fecal-Coliform Tests, and Selected Identifications for Colony Types Isolated from (Sample Site - Sample Date)*.

[c] Identifications were based upon data obtained from 59,175 strains of *K. pneumoniae* and published in the *Analytical Profile Index of Enterobacteriaceae and Other Gram-Negative Bacteria*, 9th ed., 1989.

[d] Identifications were based upon data obtained from 96,286 strains of *E. coli* and published in the book cited in footnote [c].

Table 2

MILL-PROCESS OUTFALL (003) - Sample h · 4 Jun 92 [a]

VOL (ml)	REPL #	COLIFORM TESTS: TOTAL (Presum.) L.T. Broth	TOTAL (Confirmed) BGLB Broth	FECAL E.C. Broth-1	Colony Types Purified From E.C. Broth-1 [b]	PURIFIED CULTURE REACTIONS: Colony Type Selected	Fecal Coliform Test (E.C. Broth-2)	I	M	V	C	Possibility Isolates Are *E. coli* [c]
(1)	1	+	+	+	a,b	b	+	+	+	–	–	+
	2	+	+	+	a,b ,e	a	+	–	–	+	+	–
	3	+	+	+	a,e							
	4	+	+	+	e	e	+	+	+	–	–	+
	5	+	+	+	a,b,e							
(0.1)	1	+	+	+	b	b	+	+	+	–	–	+
	2	+	+	+	a,f	f	–	–	–	+	+	–
	3	+	+	+	a	a	+	–	–	+	+	–
	4	+	+	+	b							
	5	+	+	+	a,e	e	+	+	+	–	–	+
(0.01)	1	+	+	+	a	a	+	–	–	+	+	–
	2	+	+	+	a							
	3	+	+	+	f	f	+	–	–	+	+	–
	4	+	+	+	a							
	5	+	+	+	a							
(0.001)	1	–										
	2	+	+	+	f	f	–	–	–	+	+	–
	3	+	+	+	b,e	b	+	+	+	–	–	+
						e	+	+	+	–	–	+
	4	–										
	5	–										
(0.0001)	1	–										
	2	–										
	3	–										
	4	–										
	5	–										
(0.00001)	1	–										
	2	–										
	3	–										
	4	–										
	5	–										
(0.000001)	1 - 5	–										

[a] Abbreviations: **DIL** = dilution; **REP** = sample replicate number; **L.T.** = lauryl tryptone broth (Difco); **E.C.** = E.C. broth (Difco); **BGLB.** = brilliant green lactose bile broth (Difco); **LES.** = LES Endo agar (Difco); **I** = test for indole production; **M** = test for acid production (using methylene blue); **V** = test for acetomethylcarbinol production (Voges-Proskauer test); **C** = utilization of citrate as sole carbon source (Difco Simmon's citrate agar); **T** = typical coliform colonies on LES Endo plates; **AT** = atypical coliform colonies on LES Endo plates. All tests performed according to the 17th Edition (1990) of *Standard Methods for the Examination of Water and Waste Water.*

[b] **Colony types** observed on 24h Nutrient-Agar streak plates inoculated from 24 h E.C. broth tubes. Description of colony types: **a** = 3-4.5 mm diam/shiny surface/domed shape/dense to transmitted light/smooth edge. **b** = 2-5.5 mm diam/dull surface/flat shape/thin with dense center when observed with transmitted light/most of colony is removed when touched. **c** = ca. 4 mm diam/raised shape/feathered edge. **d** = 1.5 mm diam/white/smooth edge. **e** = 3-4.5 mm diam/flat shape/concentric rings/smooth edge. **f** = 3.5-5.0 mm diam/domed shape/dense to transmitted light/smooth edge. **g** = 1.0 mm diam/tiny/white/smooth edge. **h** = 1.5-3.0 mm diam/shiney surface/dense to transmitted light/smooth edge.

[c] Based upon known *Escherichia coli* **IMViC** reactions (+ +/– –). Known cultures of *E. coli* and *Enterobacter aerogenes* were analyzed for IMViC reactions at the same time that river and outfall isolates were tested to make sure that the IMViC media was working and positive and negative reactions were correctly interpreted.

Table 3

MOST PROBABLE NUMBER OF *Escherichia coli* [a]

(API-SYSTEM IDENTIFIED) FROM 1992 GEORGIA PACIFIC SAMPLES

Location	Most Probable Number (# per 100 ml of sample)								
	17 Mar	31 Mar	14 Apr	5 May	27 May	4 Jun	23 Jun	7 Jul	21 Jul
Big Island Dam	47	20	3	27	50	37	40	60	10
Mill-Process Outfall (003)	17,000	588?	150	565	1,100	1,100	435	800	155
Coleman Falls Dam	195	31	7	20	47	125	40	260	6

[a] Cultures from each sampling site were separated by streak-plating on two successive Nutrient-Agar plates as shown on the procedures flow chart. Once purified, each colony type was described and given a letter designation, then each pure culture was identified with the API-20E Test System (see tabbed section of final report entitled *API Identifications*). Based upon these identifications, we determined the frequency that colony types were identified as *E. coli* (see accompanying table entitled *Identification of Colony Types Isolated from Georgia Pacific Samples*). Colony types *a* and *f* were identified as *E. coli* 26 of 27 and 7 of 7 times isolated, respectively. Then we then examined the test results from each sample site to determine how many of the MPN tubes contained those colony types (see accompanying table entitled *Table 6. Mill-Process Outfall (003) - Sample #2 - 4 Jun 92*). From those test results, we determined the average MPN for *E. coli* in the two samples. These numbers are shown here as Most Probable Numbers of *E. coli* in each sample taken over a five-month period in 1992.

Table 4

MOST PROBABLE NUMBER OF *Klebsiella pneumoniae* [a]

(API-IDENTIFIED) IN 1992 GEORGIA PACIFIC SAMPLES

Location	Most Probable Number (# per 100 ml of sample)								
	17 Mar	31 Mar	14 Apr	5 May	27 May	4 Jun	23 Jun	7 Jul	21 Jul
Big Island Dam	26	9	4	6	7	13	24	5	3
Mill-Process Outfall (003)	80,850	43,500	12,500	8,650	33,500	40,000	190	170	720
Coleman Falls Dam	153	21	36	50	31	60	14	10	7

[a] Cultures from each sampling site were separated by streak-plating on two successive Nutrient-Agar plates as shown on the procedures flow chart. Once purified, each colony type was described and given a letter designation, then each pure culture was identified with the API-20E Test System (see tabbed section of final report entitled *API Identifications*). Based upon these identifications, we determined the frequency that colony types were identified as *K. pneumoniae* (see accompanying table entitled *Identification of Colony Types Isolated from Georgia Pacific Samples*). Colony types **b**, **c**, and **e** were identified as *K. pneumoniae* 17 of 19, 3 of 3, and 7 of 7 times isolated, respectively. Then we then examined the test results from each sample site to determine how many of the MPN tubes contained those colony types (see accompanying table entitled *Table 6. Mill-Process Outfall (003) - Sample #2 - 4 Jun 92*). From those test results, we determined the average MPN for *E. pneumoniae* in each sample. These numbers are in the table above as Most Probable Numbers in each sample taken over a five-month period during 1992.

Table 5

Relationship of Coliforms to Flow Rates and to Physical and Chemical Data

(Revised 6 Oct 92)

#	Sampling Date	River Flow Rate (mil gal/day)	Sampling Location	Outfall Flow Rate (mil gal/day)	Temp. (°C)	pH	Biochemical Oxygen Demand (ppm)	Total Coliforms [MPNs] (#/100 ml)	Fecal Coliforms [MPNs] (#/100 ml)
1	3 Mar 92	3,157	upstream		nd[a]	7.5	2.1	755	40
			outfall 003	5.6	19.5	7.2	81.0	400,000	55,000
			downstream		nd[a]	nd[a]	nd[a]	1,400	275
2	17 Mar 92	3,158	upstream		5.3	8.0	2.7	260	120
			outfall 003	5.7	13.3	7.5	77.3	2,150,000	330,000
			downstream		7.3	8.0	nd[a]	7,500	250
3	31 Mar 92	2,375	upstream		9.6	7.7	2.0	260	100
			outfall 003	6.0	18.3	7.3	77.0	800,000	75,000
			downstream		9.8	8.0	2.3	2,300	240
4	14 Apr 92	1,262	upstream		14.2	8.5	2.1	30	10
			outfall 003	4.9	19.9	7.5	66.9	1,700,000	12,500
			downstream		14.2	8.3	nd[a]	3,700	75
5	5 May 92	1,647	upstream		16.1	8.1	2.2	185	40
			outfall 003	5.7	20.8	7.3	63.1	700,000	8,750
			downstream		17.3	8.2	2.3	1,550	60
6	27 May 92	1,550	upstream		16.3	8.3	nd	650	80
			outfall 003	5.9	22.2	7.4	67.0	50,000	33,500
			downstream		18.4	8.2	1.3	360	65
7	4 Jun 92	1,783	upstream		18.5	8.2	2.4	225	37
			outfall 003	6.0	24.3	7.4	66.9	50,000	50,000.
			downstream		18.3	8.0	2.3	570	315

(continued)

Table 5

Relationship of Coliforms to Flow Rates and to Physical and Chemical Data

(continued)

#	Sampling Date	River Flow Rate (mil gal/day)	Sampling Location	Outfall Flow Rate (mil gal/day)	Temp. (°C)	pH	Biochemical Oxygen Demand (ppm)	Total Coliforms [MPNs] (#/100 ml)	Fecal Coliforms [MPNs] (#/100 ml)
8	23 Jun 92	1,531	upstream		21.5	6.8	3.1	300	75
			outfall 003	5.8	26.0	7.2	66.3	2,600	455
			downstream		22.0	7.0	2.3	75	60
9	7 Jul 92	1,346	upstream		23.5	6.8 [b]	2.0	205	75
			outfall 003	6.0	27.0	7.4 [b]	48.0	7,000	3,000
			downstream		23.5	7.7 [b]	2.2	700	260
10	21 Jul 92	452	upstream		26.2	7.0 [b]	2.0	50	15
			outfall 003	5.0	29.6	7.3 [b]	70.0	1,300	760
			downstream		28.6	7.6 [b]	2.9	20	12

[a] nd = not determined

[b] Determination of pH made after returning to Va Tech laboratory.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Microbiology & Immunology Section
Department of Biology
2119 Derring Hall
Blacksburg, VA 24061-0406

Office (703)-231-5196
Department (703)-231-6407
FAX line (703)-231-9307
BITNET MICROFL at VTVM2

November 18, 1992

Mr. Garry T. Griffith
Environmental & Quality Control Supt.
Georgia—Pacific Corporation
P.O. Box 40
Big Island, VA 24526

Re: Report for Proposal #93-0131-07
Sponsor PO # 043012
FRS # 435156

Dear Garry:

This letter accompanies our final report which is dated 6 November 1992. The final report contains five pages of text, one figure, and five tables. Accompanying this final report is a notebook that contains nine tabbed sections; each section contains all data in table form that was submitted to you as part of the 10 interim reports sent to you during the project period.

Please let me know if you wish for us to add anything to the text of this report or if you wish to discuss any of the points made in our report.

We have enjoyed working with you and Marina on this project. Thank you for your support and kind assistance.

Sincerely,

Bill

G. William Claus, Ph.D.
Associate Professor of
Microbiology

enclosures

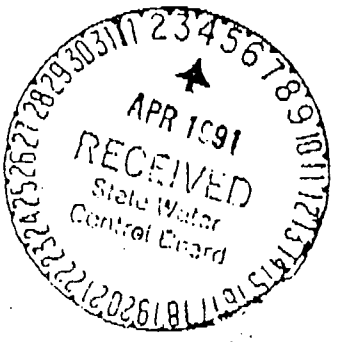
Copy sent to: B. Slagle
Va Fibre 3/94

PH <- PH

STATE DEPARTMENT OF HEALTH

Richmond, Virginia

Inter-Office Correspondence



TO: Barry T. Dunkley, P. E.
Engineering Field Director
Danville Environmental Field Office, OWP

FROM: C. M. Sawyer, P. E., Director
Division of Wastewater Engineering

SUBJECT: Disinfection of Wastewater -
Public Health Significance of Klebsiella Pneumoniae

I am enclosing a copy of a memorandum from Dr. Carl W. Armstrong, Director of the Division of Health Hazards Control, in response to your memorandum to me dated February 20, 1991, concerning the subject disinfection issue. In addition, I am enclosing a copy of a letter to the VWCB from Dr. Robert B. Stroube, Deputy Commissioner for Community Health Services, dated March 2, 1990, concerning the Department's disinfection policy.

Dr. Armstrong has concluded that the principal public health concerns relative to the presence of klebsiella pneumoniae in wastewater effluent discharges result from actual or potential primary recreational use of the receiving water.

Based on the enclosed information, this Division recommends that a site-specific beneficial use-attainability analysis study be performed by the permitted owner, as stipulated and required by the "State Water Quality Standards", to support any proposed modification of the discharge permit requirements for disinfection.

CMS/ecr
cc: Robert B. Stroube, M.D., M.P.H.
Grayson B. Miller, M.D.
Carl W. Armstrong, M.D.
Eric H. Bartsch, P.E.
Allen R. Hammer, P.E.

[illegible] <- [illegible]

COMMONWEALTH of VIRGINIA

M. G. BUTTERY, M.D., M.P.H.
ATE HEALTH COMMISSIONER

Department of Health
Richmond, Virginia 23219

March 29, 1991

MEMORANDUM:

To: C. M. Sawyer, P.E., Director
Division of Wastewater Engineering

From: Carl W. Armstrong, M.D., Director
Division of Health Hazards Control

SUBJECT: [illegible]

In response to your February 25, 1991 memorandum on this subject, I have learned that the outfall in question is 9 miles upriver from the City of Lynchburg's drinking water intake. That utility has also apparently not had problems with excessive fecal coliform counts in the raw water. Given this information, I do not anticipate a public health concern relative to drinking water supplies. Moreover, *Klebsiella* would not be expected to cause infection as a result of ingestion, this organism tends to cause infection only when circumstances allow it to gain access to a normally sterile body site (aspiration into the lungs may cause pneumonia; reflux of urine through a catheter back into the bladder may cause urinary tract infection; washing a surgical incision may lead to wound infection).

Although there is no basis for concern about drinking water, it is more difficult to dismiss the possibility of a recreational hazard. *Klebsiella* has occasionally caused wound infection outside the hospital setting (Rickman LS. *Klebsiella pneumoniae* infection complicating a puncture wound of the foot: a case report. Milit Med 1989;154:38-39). Although *K. pneumoniae* is normally present in the environment, including uncontaminated river water, an appreciable increase in concentration in river water resulting from the outfall could conceivably result in a greater probability of immersion-related infection of a wound (in a fisherman, for example). It is impossible to quantify this risk given the information at hand. It is unlikely that an epidemiologic study of sufficient power will be able to resolve this issue. Also, I do not know to what extent the effluent is diluted in the river or whether in-stream testing has shown "fecal coliforms" (as a surrogate for *K. pneumoniae*) to be present.

Becky L. France

From: nhreview (DCR) <nhreview@dcr.virginia.gov>
Sent: Monday, July 07, 2014 5:33 PM
To: France, Becky (DEQ)
Cc: 'Hillman, Brett'; 'susan_lingenfelser@fws.gov'
Subject: VA0003026, GP Big Island
Attachments: 67045, DEQ VA0003026, GP Big Island.pdf

Ms. France,

Please find attached the DCR-DNH comments for the above referenced project. The comments are in pdf format and can be printed for your records. Also species rank information is available at http://www.dcr.virginia.gov/natural_heritage/help.shtml for your reference.

Thank you for the opportunity to comment on this project.

S. Rene' Hypes
Project Review Coordinator
Department of Conservation and Recreation
Division of Natural Heritage
600 East Main Street, 24th Floor
Richmond, Virginia 23219
804-371-2708 (phone)
804-371-2674 (fax)
rene.hypes@dcr.virginia.gov

VIRGINIA NATURAL HERITAGE PROGRAM

Conserving VA's Biodiversity through Inventory, Protection and Stewardship
www.dcr.virginia.gov/natural_heritage
Virginia Natural Heritage Program on Facebook

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

600 East Main Street, 24th Floor
Richmond, Virginia 23219
(804) 786-6124

July 7, 2014

Becky France
DEQ – Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, VA 24019

Re: VA0003026, GP Big Island

Dear Ms. France:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the James River – Big Island Stream Conservation Unit (SCU) is located within the project site. SCUs identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. SCUs are also given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain. The James River – Big Island SCU has been given a biodiversity ranking of B3, which represents a site of high significance. The natural heritage resource of concern associated with this site is:

Elliptio lanceolata	Yellow lance	G2G3/S2S3/SOC/NL

The Yellow lance occurs in mid-sized rivers and second and third order streams. To survive, it needs a silt-free, stable streambed and well-oxygenated water that is free of pollutants. This species has been the subject of taxonomic debate in recent years (NatureServe, 2009). Currently in Virginia, the Yellow lance is recognized from populations in the Chowan, James, York, and Rappahannock drainages. Its range also extends into Neuse-Tar river system in North Carolina. In recent years, significant population declines have been noted across its range (NatureServe, 2009). Please note that this species is currently classified as a species of concern by the United States Fish and Wildlife Service (USFWS) however, this designation has no official legal status.

Considered good indicators of the health of aquatic ecosystems, freshwater mussels are dependent on good water quality, good physical habitat conditions, and an environment that will support populations of host fish species (Williams et al., 1993). Because mussels are sedentary organisms, they are sensitive to water quality degradation related to increased sedimentation and pollution. They are also sensitive to habitat destruction through dam construction, channelization, and dredging, and the invasion of exotic mollusk species. The Yellow lance may be particularly sensitive to chemical pollutants and exposure to fine sediments from erosion (NatureServe, 2009).

Due to the documented occurrence of the Yellow lance within the mixing zone, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

DCR-Division of Natural Heritage biologists are qualified and available to conduct inventories for rare, threatened, and endangered species. Please contact J. Christopher Ludwig, Natural Heritage Inventory Manager, at chris.ludwig@dcr.virginia.gov or 804-371-6206 to discuss arrangements for field work.

In lieu of a survey, DCR recommends adoption of the EPA ammonia criteria for Unionid mussels. To minimize impacts to aquatic resources, DCR also recommends the use of uv/ozone to replace chlorination disinfection and utilization of new technologies as they become available to improve water quality.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Gladys Cason (804-367-0909 or Gladys.Cason@dgif.virginia.gov).

Should you have any questions or concerns, feel free to contact René Hypes at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,

S. René Hypes
Project Review Coordinator

CC: Brett Hillman, USFWS
Susan Lingenfelser, USFWS

Literature Cited

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: April 5, 2010).

Williams, J.D., M.L. Warren, Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1993. Conservation status of freshwater mussels of the United States and Canada. Fisheries 18: 6-9.

Hillman, Brett <brett_hillman@fws.gov>

GP Big Island Permit VA0003026 - USFWS Comments

Hillman, Brett <brett_hillman@fws.gov> Tue, Oct 14, 2014 at 1:14 PM
To: "France, Becky (DEQ)" <Becky.France@deq.virginia.gov>
Cc: "nhreview (DCR)" <nhreview@dcr.virginia.gov>, "ProjectReview (DGIF)" <ProjectReview@dgif.virginia.gov>

Hi Becky,

Thank you for providing us with the opportunity to review the reissuance of this permit. I reviewed the materials you sent very carefully because it is a complex permit and two mussel species that are of federal concern, the yellow lance (*Elliptio lanceolata*) and the Atlantic pigtoe (*Fusconaia masoni*), are known to occur in the James River in the vicinity of the discharge. In addition, the federally listed endangered James spinymussel (*Pleurobema collina*) occurs in the Pedlar River, a tributary that enters the James River downstream of the facility's discharge. It is possible that individuals of this species may also occur in the James River.

With regards to these mussel species, we wish to comment on four issues:

1. Groundwater contamination

According to the fact sheet of the current permit, the permittee shall submit a corrective action plan if monitoring results indicate that groundwater has been contaminated. After reviewing the available groundwater data, it does appear as though the concentrations of chloride and ammonia, as well as a few other pollutants, are regularly well above the water quality standards for groundwater (Monitoring Well 11 appears to be the worst offender). Depending on the level of connectivity between the groundwater and the James River, the mussel species listed above may be negatively impacted by pollutants in the groundwater. Therefore, we believe that a corrective action plan to address this issue must be developed immediately.

2. The addition of polymer in the water clarifier

In an October 6, 2014 email, you mentioned that while polymer is not currently being added to the water clarifier, it could be at some point. If polymer is added, we request that chronic and acute toxicity tests be performed on the wastewater containing the polymer.

3. Implementation of 2013 EPA ammonia criteria

We recommend that the 2013 EPA ammonia criteria be used to determine ammonia limits for this facility, particularly for outfall 003. Although these criteria have not yet been adopted into the Virginia Water Quality Standards, they are more stringent than the current ammonia criteria and are believed to be protective of freshwater mussels. While limits may still be deemed unnecessary for this facility under these new criteria, we believe that the analysis should still be performed.

4. Presence of bis (2-ethylhexyl) phthalate in outfall 003

According to the permittee's application, bis (2-ethylhexyl) phthalate was detected in wastewater from outfall 003. Although there are no aquatic life criteria for this pollutant, it is known to be toxic to mussels and other aquatic invertebrates. Therefore, we believe that the need for a limit should be investigated and/or the source of this pollutant should be determined and eliminated.

Thanks again for giving us the chance to comment. Please let me know if you have any questions.

Best regards,
Brett

Brett Hillman
Fish and Wildlife Biologist
U.S. Fish & Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Phone: 804-824-2420
Fax: 804-693-9032
Email: brett_hillman@fws.gov

France, Becky (DEQ)

From: France, Becky (DEQ)
Sent: Wednesday, December 17, 2014 3:33 PM
To: 'Hillman, Brett'
Subject: RE: GP Big Island Permit VA0003026 - USFWS Comments

1. Groundwater Contamination – The groundwater report from GP Big Island concluded that a corrective action plan was not needed. Groundwater monitoring will continue to be required in the reissued permit. Also, a special condition will require a corrective action plan if the data indicate that there is a significant risk of offsite contamination. The Agency is currently in the process of developing procedures for evaluating groundwater risks.

2. Polymer Addition - Polymer may be added to the secondary clarifier for the industrial treatment process. Polymer addition is associated with the discharge from outfall 003 which is currently has a toxicity testing requirement. The toxicity testing requirements go back many years. There is currently a toxicity test limit with annual monitoring in the permit. At least annual monitoring is required for any parameters with limits.

3. Ammonia Criteria -- I have reviewed your comments and recommendations to apply more stringent proposed EPA criteria for ammonia.

DEQ used the current Virginia Water Standards adopted by the State Water Control Board and approved by EPA to determine VPDES effluent limitations that are protective of human health and the environment. These standards are updated on a regular basis (triennial review) to incorporate new information applicable to Virginia. DEQ acknowledges the research to support lower water quality criteria. The comments EPA received for the draft ammonia criteria are still under consideration. These criteria may not be final in Virginia for a few years and the exact numerical value of the proposed criteria may change in this process. The US Fish and Wildlife Service's concerns about the ammonia criteria may be addressed as part of the Water Quality Standards triennial review process. Following that regular review process, any adopted revisions to the Virginia to the Water Quality Standards regulations are then included in future permit actions.

4. Bis (2-ethylhexyl) phthalate -- For outfall 003 there was a data point of 30.6 ug/L. I will compare this value to the human health criteria. In accordance with Guidance Memo 94-008, it is believed that bis (2-ethylhexyl) phthalate is probably introduced to the sample by plastic/rubber apparatus used in collecting or preparing the sample for analysis. Consequently, it is recommended that analysis results should be disregarded if the substance is found in minute amounts and there is no definable source. Minute amounts are defined as less than 30 µg/L.

From: Hillman, Brett [mailto:brett_hillman@fws.gov]
Sent: Tuesday, October 14, 2014 1:15 PM
To: France, Becky (DEQ)

Cc: nhreview (DCR); ProjectReview (DGIF)
Subject: GP Big Island Permit VA0003026 - USFWS Comments

Hi Becky,

Thank you for providing us with the opportunity to review the reissuance of this permit. I reviewed the materials you sent very carefully because it is a complex permit and two mussel species that are of federal concern, the yellow lance (*Elliptio lanceolata*) and the Atlantic pigtoe (*Fusconaia masoni*), are known to occur in the James River in the vicinity of the discharge. In addition, the federally listed endangered James spinymussel (*Pleurobema collina*) occurs in the Pedlar River, a tributary that enters the James River downstream of the facility's discharge. It is possible that individuals of this species may also occur in the James River.

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2. The addition of polymer in the water clarifier

In an October 6, 2014 email, you mentioned that while polymer is not currently being added to the water clarifier, it could be at some point. If polymer is added, we request that chronic and acute toxicity tests be performed on the wastewater containing the polymer.

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Thanks again for giving us the chance to comment. Please let me know if you have any questions.

Best regards,
Brett

Brett Hillman
Fish and Wildlife Biologist
U.S. Fish & Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Phone: 804-824-2420
Fax: 804-693-9032
Email: brett_hillman@fws.gov

France, Becky (DEQ)

From: Hillman, Brett [brett_hillman@fws.gov]
Sent: Tuesday, July 01, 2014 2:39 PM
To: France, Becky (DEQ)
Subject: GP Big Island Permit - VA0003026

Hi Becky,

I have finished reviewing the 2010 materials for this upcoming permit reissuance. Before I submit comments on behalf of the USFWS, I do have a few questions:

- According to the fact sheet, polymer is "currently" not used in the water clarifier. Could it be added at some point during the permit term? How would this be accounted for?

- Would you be able to provide some more information regarding the potential groundwater contamination at the site? I'm specifically interested in this paragraph from the fact sheet:

If monitoring results indicate that any unit has contaminated the ground water, the permittee shall submit a corrective action plan within 60 days of being notified by the regional office. The plan shall set forth the steps to be taken by the permittee to ensure that the contamination source is eliminated, that the contaminant plume is contained on the permittee's property, or any leakage to surface water does not result in a violation of water quality standards.

Has a corrective action plan been submitted? If so, how much progress has been made?

- Has groundwater-to-surface water connectivity been studied?

- Finally, have you received the application yet? I'd prefer to review it before submitting comments.

Thanks in advance for helping me out with this review!

Best,
Brett

Brett Hillman
Fish and Wildlife Biologist
U.S. Fish & Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Phone: 804-824-2420
Fax: 804-693-9032

France, Becky (DEQ)

From: France, Becky (DEQ)
Sent: Wednesday, March 18, 2015 2:32 PM
To: ProjectReview (DGIF); Aschenbach, Ernie (DGIF); 'ESSProjects@dgif.virginia.gov'
Subject: DGIF Endangered Species Review for GP Big Island

A few months ago I submitted a request for an endangered species review for GP Big Island. A few weeks ago I sent you a link for the draft permit for this facility and application. Since I could not find DGIF review comments regarding the 2015 GP Big Island reissuance, I thought I would check with you and see if you had any comments. The public notice ends March 30, 2015.

The link to the most current permit and Fact Sheet is found at the following link:

http://www.deq.virginia.gov/fileshare/wps/EPA/WCRO/VA0003026%20GP%20Big%20Island/Newest%20Draft%20During%20PN/

From: France, Becky (DEQ)
Sent: Friday, June 13, 2014 5:10 PM
To: 'ESSProjects@dgif.virginia.gov'; 'susan_lingenfelser@fws.gov'; nhreview (DCR); ProjectReview (DGIF)
Subject: FW: Endangered Species Review for GP Big Island

I left out the coordination form in the previous e-mail. Here it is:

<< File: 2 Coordination Form for Endangered Species Review for GP Big Island 2014 2.doc >>

From: France, Becky (DEQ)
Sent: Friday, June 13, 2014 4:33 PM
To: 'ESSProjects@dgif.virginia.gov'; 'susan_lingenfelser@fws.gov'; nhreview (DCR); ProjectReview (DGIF)
Subject: RE: Endangered Species Review for GP Big Island

I have sent out the application for the reissuance of GP Big Island permit (VA0003026). I have also attached a copy of the 2010 permit and Fact Sheet. Attachment B contains the topographic map showing the location of the outfalls. I have not received the application yet for the 2015 permit yet. In accordance with the MOU agreement with DEQ, please review the attached information and send an e-mail with your review comments. Note that there may be changes in the reissued permit once I have drafted the new permit. I have also attached a Coordination Form for review.

http://www.deq.virginia.gov/fileshare/wps/EPA/WCRO/VA003026%20GP%20Big%20Island/

Becky L. France
Water Permit Writer
Department of Environmental Quality
3019 Peters Creek Road
Roanoke, VA 24019
(540) 562-6793

France, Becky (DEQ)

From: France, Becky (DEQ)
Sent: Tuesday, February 10, 2015 3:32 PM
To: 'Hillman, Brett'; nhreview (DCR); Hypes, Rene (DCR); 'susan_lingenfelser@fws.gov'; Aschenbach, Ernie (DGIF)
Subject: RE: Draft Permit, Application, and Fact Sheet with Attachments for GP Big Island; Endangered Species Review

Yesterday, I provided a link to the draft GP Big Island permit and Fact Sheet for review and comment. Following the submission of this draft, I participated in a staff meeting regarding the Section 316 cooling water requirements. Your draft permit submission contained the new Section 316 cooling water requirements (Part I.C.15). Based upon this meeting it became necessary to revise Part I.C.15.

I included requirements that are applicable to facilities that have submitted cooling water intake data required by 40 CFR Section 122.21(r). Due to the timeframe for the submission of the reissuance application for GP Big Island, it was not possible for the permittee to submit the data by the VPDES permit application deadline. Therefore, the permittee has been given a schedule for submission of the data by the next reissuance application deadline. So, many of the cooling water monitoring and reporting requirements that I added to the draft permit are not applicable. Therefore, I have changed Part I.C.15 to require that GP submit 40 CFR Section 122.21(r) study data and note that the permit does not authorize taking of endangered species.

DEQ is in the process of developing guidance for addressing facilities with BTA requirements for cooling water intakes. For the next permit cycle it may be appropriate to include the additional monitoring and reporting requirements to verify compliance with any final BTAs implemented from the study data.

I have added the revised Fact Sheet and permit to the link below with the date 021015 in the file name for clarity. I am sorry that in my haste to get the draft permit to you for review I did not anticipate that the meeting would result in necessary revisions to the permit. Please replace the previous Fact Sheet and permit files with the files dated 021015.

http://www.deq.virginia.gov/fileshare/wps/EPA/WCRO/VA0003026%20GP%20Big%20Island/Draft%202015/

From: France, Becky (DEQ)
Sent: Monday, February 09, 2015 5:39 PM
To: 'Hillman, Brett'; nhreview (DCR); Hypes, Rene (DCR); 'susan_lingenfelser@fws.gov'; Aschenbach, Ernie (DGIF)
Subject: Draft Permit, Application, and Fact Sheet with Attachments for GP Big Island; Endangered Species Review

In accordance with the MOU agreement with DEQ, please review the documents in the link and send an e-mail with your review comments.

This proposed permit reissuance is for a major industrial facility in the James River Basin located in Bedford County, Virginia.

http://www.deq.virginia.gov/fileshare/wps/EPA/WCRO/VA0003026%20GP%20Big%20Island/Draft%202015/

France, Becky (DEQ)

From: France, Becky (DEQ)
Sent: Monday, June 30, 2014 4:53 PM
To: Aschenbach, Ernie (DGIF)
Subject: RE: ESSLog 30939; VPDES re-issuance VA0003026 GP Big Island in Bedford County, VA

The application will be due by October 2, 2014. I will make a note to send you the application when it becomes available.

From: Aschenbach, Ernie (DGIF)
Sent: Monday, June 30, 2014 4:48 PM
To: France, Becky (DEQ); susan_lingenfelser@fws.gov; nhreview (DCR); Hillman, Brett
Cc: Cason, Gladys (DGIF); ProjectReview (DGIF)
Subject: ESSLog 30939; VPDES re-issuance VA0003026 GP Big Island in Bedford County, VA
Importance: High

According to this email, DEQ has not received the application for the proposed 2015 re-issuance of the above-reference VPDES permit. DEQ provided their URL link to the existing permit and a DEQ cover sheet (attached).

In order to provide updated guidance pertaining to the proposed re-issuance of the above-reference VPDES permit, additional information is needed. Please provide the 2015 (new) application with corresponding proposed (new) effluent characteristics when the information becomes available.

After receiving new information, we will review and provide comments as appropriate. Thanks.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
P.O. Box 11104
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
Email: Ernie.Aschenbach@dgif.virginia.gov

From: France, Becky (DEQ)
Sent: Friday, June 13, 2014 5:10 PM
To: dgif-ESS Projects (DGIF); susan_lingenfelser@fws.gov; nhreview (DCR); ProjectReview (DGIF)
Subject: FW: Endangered Species Review for GP Big Island

I left out the coordination form in the previous e-mail. Here it is:

<< File: 2 Coordination Form for Endangered Species Review for GP Big Island 2014 2.doc >>

From: France, Becky (DEQ)
Sent: Friday, June 13, 2014 4:33 PM
To: 'ESSProjects@dgif.virginia.gov'; 'susan_lingenfelser@fws.gov'; nhreview (DCR); ProjectReview (DGIF)
Subject: RE: Endangered Species Review for GP Big Island

I have sent out the application for the reissuance of GP Big Island permit (VA0003026). I have also attached a copy of the 2010 permit and Fact Sheet. Attachment B contains the topographic map showing the location of the outfalls. I have not received the application yet for the 2015 permit yet. In accordance with the MOU agreement with DEQ, please review the attached information and send an e-mail with your review comments. Note that there may be changes in the reissued permit once I have drafted the new permit. I have also attached a Coordination Form for review.

http://www.deq.virginia.gov/fileshare/wps/EPA/WCRO/VA003026%20GP%20Big%20Island/

<< File: 30939_VPDES_Permit_GP_Big_Island_2005.pdf >>

Becky L. France
Water Permit Writer
Department of Environmental Quality
3019 Peters Creek Road
Roanoke, VA 24019
(540) 562-6793
E-mail: Becky.France@deq.virginia.gov
Web: http://www.deq.virginia.gov

France, Becky (DEQ)

From: Aschenbach, Ernie (DGIF)
Sent: Wednesday, September 16, 2009 1:03 PM
To: France,Becky; Daub,Elleanore; Watson, Brian (DGIF)
Cc: Aschenbach, Ernie (DGIF)
Subject: ESSLog# 26500; DEQ VPDES re-issuance# 0003026 for the GP Big Island, LLC facility in Bedford County, Virginia

We have reviewed the application for the re-issuance of the Virginia Pollution Discharge Elimination System (VPDES) permit# 0003026 for the GP Big Island, LLC facility in Bedford County, Virginia. The facility discharges to the James River. According to the information provided, Total Residual Chlorine (TRC) is added to cooling water at a monthly average of 0.012 mg/l and a daily average of 0.024 mg/l. According to the application, water discharged from outfall 002 and 003 is de-chlorinated. Sanitary waste generated at the facility is transported to the Lynchburg Municipal Wastewater Treatment Plant for disposal.

According to our records, the state Threatened (ST) green floater is known from the area. The reach of the James River is designated Threatened and Endangered (T&E) species water for this species.

Due to the sensitivity of these species, we recommend and support that the Effluent Limitations and Monitoring Requirements specify (the above-referenced) monthly and daily average ammonia concentrations of no more than 1.0 mg/l. In order to protect the overall health of the aquatic resources, we recommend that effluent from this facility either be treated with ultraviolet light disinfection rather than chlorine, or continue to be de-chlorinated prior to discharge.

Thank you for the opportunity to provide comments.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
Email: Ernie.Aschenbach@dgif.virginia.gov

Attachment E

Ambient Water Quality Data

- **Raw Water pH and Temperature Data**
- **Upstream STORET Data (Station 2-JMS282.28)**
- **Downstream STORET Data (Station 2-JMS275.75)**
- **Ammonia Expected Instream Concentration Prior to 1996 Expansion**

VAW-H01R
2-JMS275.75 (downstream from GP Big Island)

Collection Date Time	Temp Celsius	pH (S.U.)
01/05/2006 10:30	6.5	7.8
03/20/2006 13:30	9.7	7.7
05/02/2006 13:30	17.2	7.7
07/13/2006 12:30	25.9	8.2
09/06/2006 13:00	21.4	7.9
11/28/2006 13:00	8.5	7.7
02/12/2007 14:10	1.2	8.2
04/18/2007 11:45	10.6	7.7
06/06/2007 10:45	21.9	8
08/02/2007 10:45	27.8	8.1
10/10/2007 11:30	23.3	8.1
12/27/2007 12:00	5.3	7.4
02/14/2008 12:15	3.5	7.3
04/02/2008 11:25	12.5	7.7
06/18/2008 12:15	26.5	7.9
08/06/2008 11:20	27.1	8
10/22/2008 11:40	13.6	8
12/17/2008 12:50	6.9	7.2
02/24/2009 13:30	4.1	6.8
04/09/2009 13:00	10.1	7.1
06/30/2009 13:00	25.7	8
08/06/2009 13:00	26.1	7.8
10/08/2009 14:00	18.4	7.4
12/10/2009 13:00	9	6.9
02/23/2010 12:00	8.6	7.5
04/07/2010 14:30	19.5	8.1
06/17/2010 13:30	26.2	7.9
08/25/2010 13:00	25.6	7.9
10/26/2010 11:30	16.3	8.1
12/28/2010 12:00	2.6	8.3
02/17/2011 13:30	6.8	7.5
04/20/2011 10:40	12.6	7.7
06/23/2011 14:45	26.5	7.7
08/17/2011 13:15	27	8
10/13/2011 15:00	18	7.9
12/29/2011 15:00	5.8	7.6
02/01/2012 12:10	7.3	7.8
03/01/2012 12:10	9.8	7.4
05/17/2012 11:15	17.7	7.7
07/10/2012 12:30	28.7	8
09/06/2012 11:50	26.3	7.8
11/01/2012 13:50	10.2	7.6
01/15/2013 11:45	9	8
03/07/2013 11:45	4.6	8.13
05/08/2013 14:50	12.31	7.66
07/25/2013 15:45	25.35	8.1
09/25/2013 14:10	20.8	8.18
11/21/2013 14:20	9.36	8.08
01/21/2014 14:10	3.9	7.65
03/11/2014 14:40	9.17	7.68
05/07/2014 13:55	18.91	7.86
07/23/2014 17:00	29.9	8.32

pH 90th Percentile	8.1 S.U.
pH 10th Percentile	7.4 S.U.
Temperature 90th Percentile (Jan. -May)	17.7 °C
Temperature 90th Percentile	26.5 °C

VAW-H01R
2-JMS275.75 (downstream from GP Big Island)

Collection Date Time	Hardness, Total (mg/L as $CaCO_3$
01/06/1998 12:30	71.1
02/10/1998 11:00	73.2
03/04/1998 11:20	75.9
04/21/1998 13:05	46.7
05/13/1998 13:10	55.8
06/15/1998 12:50	116
07/13/1998 14:30	140
08/04/1998 11:20	142
09/17/1998 11:25	151
10/21/1998 12:00	154
11/19/1998 11:35	168
12/01/1998 12:15	174
01/25/1999 12:30	68
02/09/1999 11:50	80
03/08/1999 12:20	72
04/13/1999 11:50	110
05/18/1999 08:55	56
06/07/1999 12:05	140
07/19/1999 11:45	126
08/09/1999 12:30	132
09/08/1999 12:00	71.6
11/09/1999 11:30	91
12/07/1999 14:20	94.6
01/11/2000 12:00	120
02/08/2000 12:00	118
03/02/2000 12:00	79
04/18/2000 11:20	69
05/17/2000 13:35	102
06/27/2000 11:40	103
07/20/2000 09:55	118
08/17/2000 10:00	122
09/18/2000 09:00	110
10/24/2000 14:30	131
11/28/2000 09:30	147
12/18/2000 11:00	112
01/29/2001 11:00	88.1
02/21/2001 10:00	113
04/03/2001 11:05	<5 *
05/10/2001 14:45	91.2
06/07/2001 11:00	93.9
07/24/2001 14:00	140
08/07/2001 13:00	112
09/10/2001 14:00	128
10/10/2001 14:00	141
11/19/2001 13:30	143
12/19/2001 13:30	120
01/14/2002 14:00	143
02/04/2002 13:30	74.7

Mean Hardness 101 mg/L
*<5 mg/L considered outlier so it was not included in calculation.

VAW-H01R
2-JMS275.75 (downstream from GP Big Island)

Collection Date Time	Hardness, Total (mg/L as $CaCO_3$
03/11/2002 13:30	98.2
04/01/2002 14:30	60
05/02/2002 10:15	64.4
06/04/2002 12:00	114
07/30/2002 12:30	101
08/29/2002 11:15	25.6
09/25/2002 11:50	176
10/31/2002 10:45	106
11/19/2002 12:10	54.7
12/18/2002 12:00	60.3
01/14/2003 12:20	77.6
02/20/2003 12:00	52.5
03/04/2003 13:30	45.3
04/08/2003 12:30	70.9
05/05/2003 13:30	62.5
06/02/2003 13:00	59.5

VAW-H01R
2-JMS282.28 (upstream from GP Big Island)

Collection Date Time	Hardness, Total (mg/L as $CaCO_3$)
1/6/1998 12:05	114
2/10/1998 11:20	86.6
3/4/1998 11:45	87.3
4/21/1998 12:45	69
5/13/1998 13:30	72.8
6/15/1998 13:10	116
7/13/1998 14:00	140
8/4/1998 11:50	150
9/17/1998 12:00	150
10/21/1998 11:30	146
11/19/1998 12:00	131
12/1/1998 11:50	177
1/25/1999 12:10	70
2/9/1999 12:20	96
3/8/1999 12:45	84
4/13/1999 12:20	126
5/18/1999 8:30	64
6/7/1999 12:25	133
7/19/1999 11:20	128
8/9/1999 12:55	132
9/8/1999 12:20	73.6
11/9/1999 11:50	95.3
12/7/1999 14:45	104
1/11/2000 12:25	126
2/8/2000 12:25	136
3/2/2000 12:25	84
4/18/2000 11:40	85
5/17/2000 14:10	113
6/27/2000 12:00	104
7/20/2000 9:30	127
8/17/2000 9:30	121
9/18/2000 8:20	109
10/24/2000 15:00	133
11/28/2000 10:00	136
12/18/2000 11:30	87.5
1/29/2001 11:30	89.3
2/21/2001 11:00	110
4/3/2001 9:30	39.8
5/10/2001 15:25	105
6/7/2001 10:30	107
7/24/2001 14:30	135
8/7/2001 14:00	94.1
9/10/2001 14:30	144
10/10/2001 14:30	148
11/19/2001 14:30	212
12/19/2001 14:00	111
1/14/2002 15:00	130
2/4/2002 14:00	84.3
3/11/2002 14:00	52.1
4/1/2002 15:00	49.1
5/2/2002 10:45	64.7
6/4/2002 12:30	121
7/30/2002 12:55	145
8/29/2002 12:00	36.6
9/25/2002 12:20	128
10/31/2002 11:20	83.3

VAW-H01R
2-JMS282.28 (upstream from GP Big Island)

Collection Date Time	Hardness, Total (mg/L as $CaCO_3$)
11/19/2002 12:45	67
12/18/2002 12:45	69.7
1/14/2003 12:45	88.6
2/20/2003 13:00	77.7
3/4/2003 14:00	51.5
4/8/2003 13:00	64.7
5/5/2003 14:30	71.9
6/2/2003 14:00	77

Mean Hardness 104 mg/L

GP Big Island
VA0003026

Intake pH Data (S.U.)

DMR Due Date	Minimum	Maximum
10-Nov-11	7.7	8.5
10-Dec-11	7.7	8.7
10-Jan-12	7.5	8.3
10-Feb-12	7.8	8.9
10-Mar-12	7.8	8.6
10-Apr-12	7.6	8.5
10-May-12	7.7	8.7
10-Jun-12	7.7	8.5
10-Jul-12	8	8.5
10-Aug-12	7.1	8.7
10-Sep-12	7.7	8.4
10-Oct-12	7.9	8.5
10-Nov-12	7.9	8.6
10-Dec-12	8.3	8.8
10-Jan-13	8.1	8.6
10-Feb-13	7.8	8.6
10-Mar-13	7.8	8.7
10-Apr-13	7.3	8.1
10-May-13	7.4	8.2
10-Jun-13	7.7	8.7
10-Jul-13	7.9	8.5
10-Aug-13	7.7	8.4
10-Sep-13	8	8.3
10-Oct-13	8	8.4
10-Nov-13	8	8.4
10-Dec-13	7.7	8.3
10-Jan-14	6.8	8.2
10-Feb-14	7.8	8.1
10-Mar-14	6.9	8.1
10-Apr-14	7.8	8.1
10-May-14	7.3	8.2
10-Jun-14	7.5	8.5
10-Jul-14	8	8.6
10-Aug-14	7.9	8.6
10-Sep-14	7.7	8.2
10-Oct-14	7.9	8.4

90th Percentile pH	8.7 S.U.
10th Percentile pH	7.3 S.U.

GP Big Island
VA0003026

Intake Temperature Data (°C)

Date DMR Due	Temperature
10-Nov-11	20
10-Dec-11	16
10-Jan-12	14
10-Feb-12	12
10-Mar-12	13
10-Apr-12	20
10-May-12	21
10-Jun-12	26
10-Jul-12	27
10-Aug-12	30
10-Sep-12	29
10-Oct-12	27
10-Nov-12	21
10-Dec-12	13
10-Jan-13	14
10-Feb-13	13
10-Mar-13	10
10-Apr-13	11
10-May-13	20
10-Jun-13	25
10-Jul-13	26
10-Aug-13	27
10-Sep-13	27
10-Oct-13	26
10-Nov-13	22
10-Dec-13	16
10-Jan-14	13
10-Feb-14	9
10-Mar-14	10
10-Apr-14	12
10-May-14	17
10-Jun-14	24
10-Jul-14	27
10-Aug-14	28
10-Sep-14	26
10-Oct-14	27

90th Percentile Temperature	27 °C	
90th Percentile Temperature	25 °C	January - May

Analysis of the GP 003 a [redacted] e mixing zone [redacted] d[redacted] for ammonia

(after 5:1 dilution)

The statistics for ammonia are:

Number of values	=	24
Quantification level	=	.1
Number < quantification	=	3
Expected value	=	.2875171
Variance	=	3.081173E-02
C.V.	=	.6105123
Statistics used	=	delta lognormal

Applies to acute standard only

Effluent data used as existing upstream data

The Standards for ammonia are:

Acute Standard	=	1.39
Chronic Standard	=	.317
Human Health Standard	=	----

The 97th percentile of daily values = .7212251

[redacted]

The 97th percentile of 30 day averages = .3477989

The Acute standard is not violated.

[redacted]

DATA

.6
.2
.18
.08
.12
.36
.54
.24
.2
.42
.3
.32
.52
.5
.28
.34
.18
.16
.16
.06
.08
.12
.24
.56

alysis of the James Ri at RM 275.75 prior to Nc 1994 [redacted] data for ammonia

establishes existing concentration instream prior to expansion under chronic conditions

The statistics for ammonia are:

Number of values	= 75
Quantification level	= .04
Number < quantification	= 37
Expected value	= 5.474539E-02
Variance	= 6.008601E-04
C.V.	= .4477536
Statistics used	= delta lognormal

The Standards for ammonia are:

Acute Standard	= 2.028
Chronic Standard	= .462
Human Health Standard	= ----

downstream

The 97th percentile of daily values =	.116928
The 97th percentile of 4 day averages =	.075888
The 97th percentile of 30 day averages =	6.170455E-02

The Acute standard is not violated.
The Chronic standard is not violated.
The Human health standard is not violated.

DATA		
<.04	<.04	.05
<.04	<.04	.09
.07	.08	.05
<.04	.16	.1
.04	.09	.07
.12	<.04	<.04
<.04	<.04	
.01	<.04	
<.04	<.04	
<.04	.05	
.05	.04	
<.04	.05	
<.04	.04	
.08	.04	
.07	.05	
.07	<.04	
.07	<.04	
.04	<.04	
<.04	.09	
<.04	<.04	
<.04	<.04	
<.04	<.04	
<.04	.08	
.04	.07	
.06	.08	
.05	.04	
.14	.06	
.08	<.04	
.12	<.04	
.04	<.04	
<.04	.07	
<.04	<.04	
<.04	0.04	
<.04	<.04	
<.04		

Attachment F

Groundwater

- **Groundwater Data**
- **Groundwater Management Program Plan (Excerpt)**

GP Big Island Groundwater Monitoring Data (VA0003026)

MW-6 (Upgradient from Primary Ponds) 610.23 top of screen 5.67' , TOC = 615.73, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.8**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
6	8/5/92	608.25	6.5	6.2	**10**	5	**925**	nd	nd	1	7.2	nd
6	11/92	607.20	6.4	5.1	**5**	13	**25**	nd	nd	2	6.9	nd
6	2/92	**610.60**	6.0	8	**16**	6	**671**	nd	2	2	6.1	5
6	5/93	**612.40**	6.6	6.5	**1**	15	14	**3**	nd	nd	6.9	14
6	4/95	604.72	6.5	6.1	**5.4**	21	nd	**0.8**	1	14	8.1	11
6	10/95	604.70	6.6	4	**1.8**	15	nd	nd	nd	4	13.3	nd
6	6/5/97	605.71	6.6	2.8	**4.6**	13	nd	**1.5**	nd	nd	6.2	13
6	12/9/98	601.13	6.3	1.8	**1.7**	20	nd	nd	nd	nd	9.0	11
6	6/17/1999	602.40	6.5	4.8	**1.5**	4	**660**	<0.1	1J	3	7.8	<5
6	12/9/1999	603.88	6.6	7.6	**4.3**	20	**1200**	**1.6**	5J	2J	11.7	**66**
6	6/22/2000	604.91	6.4	6.5	**1.9**	22	**1500**	**0.7J**	3B	2	10.4	48
6	12/14/2000	603.65	6.6	4.8	**2**	19	<25	<0.1	1J	<1	12.0	8
6	6/6/2001	605.15	6.5	3.3	**1.2**	5	9	<0.4	<1	<2.6	5.5	<1.9
6	12/7/2001	600.43	6.4	4.2	**2.5**	24	<5	<0.4	<1	<2.6	16.0	<1.9
6	6/20/2002	600.91	6.6	5.8	**3.7**	21	12	<0.5	<0.7	<1.5	14.2	<1.3
6	12/19/2002	605.03	6.7	4.7	**4.1**	**27**	**140.6**	<0.6	4.1J	<2.2	19.2	< 3.1
6	6/25/2003	**614.74**	6.5	5.7	**4.8**	21	<5	<0.5	3J	<2.9	17.2	24
6	12/2/2003	**612.46**	6.4	4.1	**12.3**	**28**	<5.0	**0.9J**	3.0	<2.9	16.5	15.8
6	6/22/2004	608.93	6.5	7.5	0.008	23	<5.0	<0.5	<1.3	<2.9	23.5	**98**
6	12/14/2004	**612.05**	6.5	2.9	**4.5**	23	<5.0	<0.4	<0.9	<1.4	**25.8**	**231**
6	6/22/2005	607.47	6.3	**11.3**	**8.7**	19	<1	<0.2	<1.0	<1	12.4	36
6	12/14/2005	609.30	6.7	2.4	**2.2**	21	<5	<0.2	<1.0	<1.0	13.6	11
6	6/14/2006	605.03	7.0	4.7	**0.6**	20	<5	<0.2	<1.0	<1.0	14.7	26
6	12/19/2006	609.30	6.5	4.6	**5.1**	23	<5	<0.2	<1	<1	14.0	<3
6	4/25/2007	612.45	6.8	2.0	**3.4**	24	37	<1.0	<5	0.15	17.0	33
6	10/25/2007	602.51	6.8	**17.0**	**1.5**	20	175	<0.5	<0.4	<4	14.4	18.3
6	4/23/2008	603.73	6.7	**12.3**	**1.4**	21	<25	<0.5	<0.4	<4	16.2	16.1
6	10/22/2008	602.58	6.8	**26.7**	**1.7**	21	<25.0	<1.0	<5.0	<5.0	16.6	30.8
6	5/18/2009	613.55	6.8	**6.9**	**1.7**	17	<25.0	<0.5	<0.4	<4	18.5	<0.4
6	10/27/2009	603.44	7.6	**23.9**	**2.8**	16	<25.0	<1.0	<5.0	<5.0	18.1	<10.0
6	4/13/2010	612.87	7.6	**10.6**	**3.3**	17	<25.0	<1.0	<5.0	<5.0	14.4	<10.0
6	4/20/2011	613.38	6.5	0.6	**1.5**	13	5	<1.0	--	--	13.2	28
6	4/25/2012	609.73	6.4	2.34	**3.62**	10.3	<5	<1.0	--	--	13.8	8
6	4/10/2013	609.53	6.4	1.86	**2.51**	15.4	<5	<1.0	--	--	12.2	<50
6	4/22/2014	613.87	6.4	2.07	**1.97**	13.4	<5.0	<1.0	--	--	11.7	8

MW-7 (Downgradient from Primary Ponds) 591.17 top of screen 19.67' TOC= 610.77, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2'	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
7	8/5/92	595.18	6.5	4.3	< 1	17	**62**	0.2	1	nd	**43**	nd
7	11/92	594.10	6.3	4	**1**	20	**37**	nd	nd	2	**57**	nd
7	2/92	596.50	6.0	9.2	< 1	17	**429**	0.2	3	2	**34**	13
7	5/93	597.60	6.3	7.9	< 1	23	**28**	**1.5**	nd	2	**52**	nd
7	4/95	594.31	6.5	3.8	**1**	22	**62**	0.1	1	10	**58**	6
7	10/95	593.96	6.4	3.9	**0.8**	**28**	nd	0.3	nd	5	**65**	nd
7	6/5/97	595.05	6.7	3.9	**1.2**	**26**	nd	**0.9**	nd	nd	**75**	16
7	12/9/98	592.19	6.3	4.4	**1.1**	**27**	nd	0.4	nd	nd	**61**	22
7	6/17/1999	592.78	6.5	4.9	**1.2**	20	**330**	<0.1	<1	<1	**77**	<5
7	12/9/1999	593.31	6.6	5.5	**1.7**	**34**	**760**	nd	6	1	**80**	**226**
7	6/22/2000	593.72	6.6	**17.3**	**0.9**	**27**	**1000**	0.2	2	1	**84**	46
7	12/14/2000	593.12	6.5	4.4	**0.9**	25	<25	<0.1	<1	<1	**83**	8
7	6/6/2001	594.33	6.5	4.1	**1.4**	**31**	4	<0.4	<1	<2.6	**91**	<1.9
7	12/7/2001	591.83	6.6	4.2	**1.3**	**29**	<5	<0.4	<1	<2.6	**82**	<1.9
7	6/20/2002	592.10	6.7	5.5	**3.1**	**32**	16	<0.5	<0.7	<1.5	**139**	<1.3
7	12/19/2002	594.27	6.7	5.9	**1.0**	**32**	11.9	<0.6	3.8	<2.2	**132**	5.8
7	6/10/2003	599.93	6.5	5.7	**1.1**	**33**	<5	<0.5	<1.3	<2.9	**90**	27.0
7	12/2/2003	597.52	6.5	3.7	**0.7**	**34**	<5.0	<0.5	<1.3	<2.9	**106**	15.0
7	6/22/2004	595.92	6.6	8.5	**0.2**	**37**	<5.0	<0.5	2	<2.9	**143**	**240**
7	12/14/2004	**612.05**	6.7	7.1	**0.4**	**37**	**34.5**	1	3	<1.4	**156**	**228**
7	6/22/2005	595.13	6.7	7.91	**1.02**	**36.3**	5	0.2	<1	<1	**133**	32
7	12/14/2005	595.19	6.8	5.91	**0.86**	**39.3**	5	0.3	<1	<1	**114**	16
7	6/14/2006	593.89	7.3	7.17	**1.07**	**38.7**	<5	<0.2	<1	<1	**105**	5
7	12/19/2006	595.53	6.8	6.37	**0.88**	**41.5**	<5	1	<1	<1	**103**	6
7	4/25/2007	597.32	6.8	6.5	**1.0**	**42**	<20	<1.0	<5.0	<5.0	**93**	22
7	10/25/2007	592.42	6.8	5.9	**1.4**	**40.2**	**47**	<0.5	<0.4	<4	**72**	13.2
7	4/24/2008	594.41	6.6	8.8	**1.4**	**42.5**	<25	<1.0	<5.0	<5.0	**75**	21.7
7	10/22/2008	592.42	6.8	**42.9**	**1.1**	**42.8**	<25.0	<1.0	<5.0	<5.0	**76**	16.9
7	5/18/2009	597.02	6.8	6.2	0.86	**34.7**	<25.0	<0.50	<0.40	<4.0	**79**	<0.4
7	10/28/2009	593.49	7.6	**12.6**	**1.9**	**42.2**	<25.0	<1.0	<5.0	<5.0	**90**	11.5
7	4/13/2010	597.60	7.6	**16.8**	**0.93**	**43.7**	<25.0	<1.0	<5.0	<5.0	**89**	33.3
7	4/20/2011	598.35	6.7	5.07	**0.83**	**43.4**	10	0.4	--	--	**129**	24
7	4/25/2012	595.99	6.7	5.81	**0.91**	**48.4**	15	0.5J	--	--	**146**	17J
7	4/10/2013	596.13	6.4	5.44	**0.71**	**41.8**	15	<1.0	--	--	**100**	<50
7	4/22/2014	598.00	6.6	6.77	**0.68**	**42.7**	15	**4**	--	--	**126**	7

MW-8 (Downgradient from Primary Ponds) 600.17 top of screen 11.67' TOC=611.75, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
8	8/5/92	594.11	6.6	9.9	< 1	11	12 (1)	0.1	2	nd	**35**	6
8	11/92	594.10	6.2	4.9	< 1	21	**50**	**0.8**	nd	1	**53**	nd
8	2/92	596.40	5.6	8	< 1	7	**57**	**0.4**	2	nd	19	nd
8	5/93	597.40	5.6	4.7	< 1	4	nd	**7.2**	nd	1	11	13
8	4/95	594.28	6.1	2.5	**1.2**	21	nd	0.1	nd	9	**61**	11
8	10/95	593.95	6.5	3.9	**0.4**	24	nd	0.1	nd	4	**62**	nd
8	6/5/97	595.07	6.7	5.6	**1.0**	25	15	**0.7**	nd	nd	**83**	17
8	12/9/98	592.15	6.2	5.3	**0.9**	23	nd	nd	nd	nd	**81**	8
8	6/17/1999	592.57	6.4	4.8	**1.2**	7	**500**	<0.1	<1	<1	**71**	<5
8	12/9/1999	593.27	6.6	5.7	**1.1**	4	**700**	0.2	4	2	**74**	26
8	6/22/2000	593.60	6.5	5.5	**0.6**	22	**1100**	0.1	2	1	**64**	21
8	12/14/2000	592.95	6.5	3.7	**0.6**	15	**42.2**	<0.1	<1	<1	**75**	7
8	6/6/2001	594.27	6.2	1.5	**0.4**	25	<1	<0.4	<1	<2.6	**78**	<1.9
8	12/7/2001	592.45	6.6	5.6	**1.3**	**30**	<5	<0.4	<1	<2.6	**116**	<1.9
8	6/20/2002	592.05	6.6	3.2	**5.2**	**32**	**23**	<0.5	<0.7	<1.5	**144**	<1.3
8	12/19/2002	594.75	6.8	5.9	**1.1**	**33**	**21.5**	<0.6	2.7	<2.2	**145**	8
8	6/10/2003	599.88	6.0	2.8	**1.1**	**33**	<5	<0.5	<1.3	<2.9	11	<1.3
8	12/2/2003	597.48	6.3	2.1	**0.5**	17	<5.0	<0.5	<1.3	<2.9	**56**	13.8
8	6/22/2004	595.90	6.2	3.1	**0.3**	18	6.6	<0.5	<1.3	<2.9	**118**	**89**
8	12/14/2004	597.34	6.6	4.2	**0.9**	**31**	8.4	<0.4	<0.9	<1.4	**107**	**241**
8	6/22/2005	595.08	6.4	6.6	**0.7**	**33**	5	<0.2	<1	<1	**124**	35
8	12/14/2005	595.16	6.9	6.6	**1.1**	**38**	5	<0.2	<1	<1	**104**	15
8	6/14/2006	593.84	7.2	6.3	**1.3**	**36**	<5	<0.2	<0.1	<1	**109**	18
8	12/19/2006	595.52	6.9	4.0	**0.7**	**42**	<5	<0.2	<0.1	<1	**102**	4
8	4/25/2007	597.26	6.8	5.1	**1.7**	**39**	**263**	<1.0	<5.0	<5.0	**71**	21
8	10/25/2007	592.47	6.8	6.3	**1.3**	**42**	**97**	<0.5	<0.4	<4	**71**	15.3
8	4/23/2008	594.26	6.8	**27.9**	**1.4**	**41**	<25	<1.0	<5.0	<5.0	**81**	20.4
8	10/22/2008	592.40	6.8	**38.4**	**1.4**	**44**	<25.0	<1.0	<5.0	<5.0	**82**	10.9
8	5/18/2009	597.02	6.9	6.1	**1.6**	**41**	<25.0	<0.50	<0.40	<4.0	**82**	<0.4
8	10/29/2009	593.47	7.6	**15.1**	**1.1**	**42**	<25.0	<1.0	<5.0	<5.0	**91**	**55.5**
8	4/13/2010	597.58	7.6	1.2	**0.2**	**11**	<25.0	<1.0	<5.0	<5.0	**71**	19.1
8	4/20/2011	598.33	6.7	6.1	**2.0**	**45**	10	0.6	--	--	**130**	<50
8	4/25/2012	595.98	6.5	5.5	**2.0**	**35**	15	<1.0	--	--	**82**	10J
8	4/10/2013	596.13	6.5	6.9	**2.8**	**45**	15	<1.0	--	--	**104**	<50
8	4/22/2014	597.95	6.3	2.3	**0.3**	10	<5.0	<1.0	--	--	16	4

MW-9 (Upgradient from Aeration Basin and Polishing Ponds)

599.57 top of screen 17.67' TOC=617.13, 10 ' I (9R: 617.92 MP Elev., adjacent to access road on northern side of WWTP)

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
9	8/5/92	596.52	5.7	2.2	< 1	3	**37**	**2.4**	3	nd	4.4	nd
9	11/92	599.10	**5.4**	2	< 1	7	**50**	**0.7**	nd	nd	4.5	nd
9	2/92	597.80	**5.0**	3.8	< 1		nd	**0.7**	3	nd	3.0	19
9	5/93	599.20	5.5	1.8	< 1	4	nd	nd	nd	1	3.9	10
9	4/95	595.92	6.2	0.7	**0.2**	15	nd	0.2	1	nd	4.2	nd
9	10/95	596.42	**5.0**	0.7	nd	13	nd	0.3	nd	1	3.7	nd
9	6/5/97	597.56	**5.4**	nd	< 1	7	nd	0.4	4	nd	5.3	18
9	12/9/98	595.31	**5.0**	1.1	nd	23	nd	**0.6**	nd	nd	17.0	12
9	6/17/1999	596.39	5.9	1.2	**0.3**	18	**90**	0.4	<1	<1	15.7	<5
9	12/9/1999	597.59	**5.4**	1.4	**0.2**	18	**280**	0.4	3	1	8.8	26
9	6/22/2000	597.45	5.8	1.8	<0.1	17	**340**	0.4	3	1	**26.2**	34
9	12/14/2000	597.10	5.6	1.4	<0.1	16	<25	0.3	1	<1	**54.0**	10
9R	8/8/2001	597.96	**5.4**	<0.9	**0.2**	16.7	<1	<0.5	<0.7	<1.5	12.6	<1.3
9R	12/7/2001	597.67	5.6	1.7	<0.1	21	<5	<0.4	<1	<2.6	14.5	<1.9
9R	6/20/2002	598.06	6.0	<0.4	**1.6**	18	**165**	**1.0**	<0.7	<1.5	**27.2**	<1.3
9R	12/19/2002	591.65	6.2	<1	**0.2**	15.2	**12.3**	**0.7**	2	<2.2	21.8	10.4
9R	6/9/2003	606.37	6.0	1.8	**0.5**	11.7	<5	**0.9**	<1.3	<2.9	10.0	<1.3
9R	12/2/2003	601.59	6.2	<0.5	**0.1**	13.8	<5.0	<0.5	<1.3	<2.9	8.9	13.3
9R	6/22/2004	599.41	5.6	1.2	<0.063	14.3	<5.0	<0.5	<1.3	<2.9	10.5	**188**
9R	12/14/2004	602.37	6.3	1.44	**0.097**	17.7	**58.2**	<0.4	<0.9	<1.4	14.3	**57**
9R	6/22/2005	599.50	5.5	3.75	<0.02	11.1	5	**0.4**	<1	<1	7.0	26
9R	12/14/2005	601.71	5.8	1.63	<0.02	15.7	**50**	**0.8**	<1	<1	8.2	21
9R	6/14/2006	597.60	6.2	2.4	<0.1	13.9	**50**	<0.2	<0.1	<1	8.2	9
9R	12/19/2006	599.83	5.8	1.24	<0.10	16.1	<5	0.4	<1	<1	8.8	9
9R	4/25/2007	601.60	5.6	1.2	<0.10	17	<20	0.77	0.32	<5.0	10.0	20
9R	10/25/2007	596.98	5.6	1.0	<.10	15.0	<20	<0.5	<0.4	<4	7.6	13.7
9R	4/23/2008	600.09	5.5	**12.8**	<0.10	15.4	<25	<1.0	<5.0	<5.0	**89.1**	18.6
9R	10/22/2008	597.54	5.5	4.0	<0.10	16.5	<25.0	<1.0	<5.0	<5.0	**85.7**	13
9R	5/18/2009	606.36	6.6	3.1	<0.10	15.5	<25.0	<0.5	<0.40	<4.0	9.9	<0.4
9R	10/24/2009	597.90	7.6	3.8	<0.10	14.3	<25.0	<1.0	<5.0	<5.0	12.0	21.2
9R	4/13/2010	602.09	7.6	4.3	<0.10	14.3	<25.0	**1.5**	<5.0	<5.0	**71.3**	10.1
9R	4/20/2011	605.27	5.6	<1.0	<010	13.2	5	**0.9**	--	--	9.8	8
9R	4/25/2012	600.48	5.8	2.16	**0.05**	14.5	<5	**0.7**	--	--	10.4	6
9R	4/10/2013	601.79	5.2	1.57	<0.10	12.0	<5	**0.8J**	--	--	10.1	11J
9R	4/22/2014	602.94	5.3	1.91	<0.04	10.2	<5.0	**0.6**	--	--	9.6	8J

MW-10 (Downgradient from Polishing Pond) 597.69 top of screen 16.67' TOC= 614.25, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
10	8/5/92	589.18	6.4	2.3	< 1	11	**25**	**4.4**	4	2	18	**62**
10	11/92	592.20	6.3	4.4	< 1	20	**38**	0.2	nd	nd	19	10
10	2/92	589.70	6.0	8.5	< 1	20	**214**	nd	4	nd	15	16
10	5/93	590.20	7.0	11	< 1	24	14	**3.3**	nd	1	12	nd
10	4/95	589.64	7.0	7	**0.6**	23	nd	nd	1	9	22	7
10	10/95	589.50	6.5	4.8	**0.6**	**27**	nd	nd	nd	2	21	nd
10	6/5/97	592.55	6.9	4.5	**0.9**	**40**	nd	1	1	nd	**84**	9
10	12/9/98	589.26	6.5	6.6	**0.8**	20	nd	0.3	nd	nd	**88**	20
10	6/17/1999	589.20	6.7	6.7	**0.2**	2	**580**	<0.1	<1	<1	**91**	<5
10	12/9/1999	590.42	6.6	8.3	**1.2**	3	**280**	nd	3	2	**105**	49
10	6/22/2000	589.85	6.6	**61.7**	**1.1**	**42**	**1100**	0.3	1	<1	**85**	15
10	12/14/2000	589.65	6.5	7.7	**2.8**	**35**	**39.9**	<0.1	<1	<1	**106**	6
10	6/6/2001	590.27	6.4	4.8	**0.2**	**46**	<1	<0.4	<1	<2.6	**115**	<1.9
10	12/7/2001	597.67	6.8	8.7	**1.6**	**51**	<5	<0.4	<1	<2.6	**148**	<1.9
10	6/20/2002	589.10	6.9	8.6	**0.4**	**49**	**23**	<0.5	<0.7	<1.5	**117**	20
10	12/19/2002	591.65	6.7	7.6	**2.8**	**51**	**10.5**	<0.6	4.9	<2.2	**200**	<3.1
10	6/10/2003	593.71	6.6	6.9	**2.6**	**54**	<5	<0.5	2.5	<2.9	**128**	<1.3
10	12/2/2003	591.50	6.6	7.6	**2.6**	**61**	<5.0	<1.0	<1.3	<2.9	**157**	21
10	6/22/2004	590.48	6.5	8.3	**2.5**	**51**	<5.0	<0.5	<1.3	<2.9	**166**	**122**
10	12/14/2004	592.35	6.7	7.0	**1.9**	**52**	5.9	<0.4	<0.9	<1.4	**192**	**175**
10	6/22/2005	589.84	6.6	8.1	**2.0**	**47**	**20**	**0.4**	<1	<1	**182**	30
10	12/14/2005	590.22	6.8	9.3	**4.1**	**49**	10	<0.2	<1	<1	**164**	10
10	6/14/2006	589.43	7.3	9.6	**1.1**	**46**	<5	<0.2	<1	<1	**155**	10
10	12/19/2006	589.88	6.3	6.9	**1.7**	**57**	<5	<0.2	<1	<1	**149**	15
10	4/25/2007	590.78	6.7	8.3	**2.2**	**54**	**291**	<1.0	<5.0	<5.0	**100**	19
10	10/25/2007	589.32	6.7	2.8	**0.6**	**50**	**568**	<0.5	<.4	<4	**47**	18.8
10	4/23/2008	596.34	6.6	**13.8**	**1.3**	**48**	<25	<1.0	<5.0	<5.0	**82**	18.9
10	10/24/2008	588.35	6.6	**22.8**	**0.5**	**42**	<25.0	<1.0	<5.0	<5.0	**57**	<10
10	5/18/2009	592.86	7.2	**18.6**	**1.6**	**54**	<25.0	<0.5	<0.4	<4.0	**181**	<0.4
10	10/28/2009	589.40	7.6	**12.1**	**0.9**	**42**	<25.0	<1.0	<5.0	<5.0	**158**	15.1
10	4/13/2010	590.62	7.6	**14.2**	**2.1**	**52**	**28**	<1.0	<5.0	<5.0	**126**	<10
10	4/20/2011	594.07	6.7	8.0	**2.0**	**67**	15	<1.0	--	--	**269**	8
10	4/25/2012	590.30	6.7	9.8	**1.5**	**64**	15	<1.0	--	--	**251**	5J
10	4/10/2013	590.90	6.5	9.17	**1.4**	**77**	10	<1.0	--	--	**233**	<50
10	4/22/2014	591.01	6.6	9.48	**1.6**	**77**	15	<0.2	--	--	**240**	4

MW-11 (Downgradient from Aeration Basin)

602.68 11a-top of screen 15.67' TOC= 619.64, 10 ' long 11b-19.67'; TOC=619.64' between aeration and settling ponds

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
11	8/5/92	590.87	6.9	8.1	**3**	25	**312 (1)**	0.3	3	nd	**95**	8
11	11/92	591.80	6.3	5.4	**8**	**40**	12	0.3	nd	1	**193**	nd
11	2/92	591.70	6.1	2.8	**4**	**27**	nd	**0.5**	3	nd	**101**	23
11	5/93	592.70	6.6	4.6	< 1	**32**	14	**0.6**	nd	1	**85**	nd
11	4/95	591.41	6.9	3.3	**0.7**	15	nd	0.2	1	17	**208**	5
11	10/95	591.50	6.5	4.4	**1.1**	**39**	14	0.3	nd	10	**218**	nd
11	6/5/97	594.14	6.8	5.6	**1.1**	**53**	**17**	**1.8**	1	nd	**297**	17
11	12/9/98	591.63	6.5	7.8	**2.3**	**43**	**31**	**1.5**	nd	nd	**245**	nd
11	6/17/1999	591.33	6.6	8.1	**1.9**	**40**	**260**	0.1	2	<1	**299**	<5
11	12/9/1999	592.13	6.7	9.1	**1.5**	**49**	**200**	0.2	4	4	**264**	**120**
11	6/22/2000	592.38	6.5	**10.3**	**2.2**	**47**	**110**	0.2	1	1	**285**	31
11	12/14/2000	592.57	6.7	9.8	**3.0**	**40**	<25	0.3	<1	<1	**298**	<5
11	6/6/2001	593.47	6.7	6.8	**3.6**	**44.6**	<1	<0.4	<1	<2.6	**273**	<1.9
11	12/7/2001	592.81	6.7	8.4	**3.1**	**42.8**	<5	<0.4	<1	<2.6	**225**	<1.9
11	6/20/2002	592.38	6.9	10.0	**6.1**	**48.2**	**468**	**1.0**	<0.7	<1.5	**243**	26
11	12/19/2002	595.64	6.9	10.0	**2.8**	**51**	**48.3**	<0.6	4.9	<2.2	**200**	<3.1
11	6/10/2003	595.83	6.8	**11.4**	**7.9**	**43**	**17.2**	**0.8**	3.1	>2.9	**348**	15.1
11	12/2/2003	594.28	6.8	**10.1**	**8.5**	**62.8**	**45.6**	<0.5	1.5	<2.9	**354**	12
11	6/22/2004	593.19	6.6	**13.2**	**13.9**	**55**	**7.6**	<0.5	<1.3	<2.9	**331**	**202**
11	12/14/2004	595.08	6.9	**11.8**	**16.1**	**60.4**	**108.2**	<0.4	<0.9	<1.4	**476**	**277**
11	6/22/2005	592.92	6.9	**15.7**	**22.4**	**64.1**	**90**	**0.4**	<1	<1	**360**	29
11B	12/14/2005	592.92	7.04	**17.7**	**6.51**	**72.1**	10	0.2	<1	<1	**309**	8
11B	6/14/2006	591.64	7.39	**20.8**	**24.6**	**59.5**	<5	<0.2	<1	<1	**351**	13
11B	12/19/2006	592.46	6.86	**19.7**	**15.1**	**61.7**	150	0.2	<1	2	**326**	6
11B	4/25/2007	593.96	7.03	**18**	**46**	**71**	**51**	0.28	0.64	<5.0	**100**	23
11B	10/25/2007	591.6	7.04	**45.5**	**53.8**	**72.8**	**105**	<0.5	<0.4	<4	**79.8**	21.9
11B	4/24/2008	537.95	7.1	**28**	**49.5**	**77**	**95**	<1.0	<5.0	<5.0	**99.3**	24.8
11B	10/24/2008	591.26	7.2	**45.6**	**55.8**	**83.5**	**146**	**8.1**	<5.0	<5.0	**262**	17.4
11B	5/18/2009	595.48	6.42	**37.6**	**53.8**	**76.9**	**100**	<0.50	<0.40	<4.0	**234**	<0.4
11B	10/27/2009	592.12	7.1	**44.9**	**63.2**	**78.2**	**130**	<1.0	<5.0	<5.0	**257**	17.3
11B	4/13/2010	592.7	7.6	**35.8**	**65.1**	**78.2**	**86**	<1.0	<5.0	<5.0	**225**	<10
11B	4/20/2011	596.91	6.85	**20**	**49.6**	**81.8**	**60**	<1.0	--	--	**315**	11
11B	4/25/2012	592.74	6.85	**22.1**	**71.4**	**72.6**	**75**	0.2J	--	--	**299**	7
11B	4/10/2013	593.88	6.79	**22.6**	**50.1**	**82.2**	**70**	<1.0	--	--	**310**	<50
11B	4/22/2014	593.91	6.93	**25.4**	**81.4**	**73**	**40**	<1.0	--	--	**298**	6

MW-12 (Upgradient from Sludge Lagoons) 603.69 top of screen 10.67'; TOC=614.36, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2'	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
12	8/5/92	603.05	6.8	0.8	< 1	9	12	0.1	nd	3	9	nd
12	11/92	603.40	5.8	0.9	< 1	6	**138**	0.4		nd	7	15
12	2/92	**603.80**	5.6	3.3	< 1	14	14	0.1	3	nd	6	20
12	5/93	603.40	6.5	1.8	< 1	15	nd	**6.8**		1	9	**77**
12	4/95	598.81	6.7	0.7	**0.4**	23	nd	nd	nd	5	9	nd
12	10/95	**605.25**	5.6	0.7	nd	**26**	nd	nd	nd	1	10	nd
12	6/5/97	**605.55**	6.4	nd	0.1	14	nd	0.3	nd	nd	11	11
12	12/9/98	603.69	5.5	1.5	nd	**28**	nd	1.2	nd	nd	20	21
12	6/17/1999	**604.44**	6.6	1.5	**0.4**	15	**120**	0.2	<1	<1	**27**	<5
12	12/9/1999	**605.59**	5.9	9.1	**0.1**	**34**	**180**	0.1	3	2	**26**	**55**
12	6/22/2000	**605.93**	7.0	**10.7**	<.1	**37**	**360**	0.1	1	1	24	18
12	12/14/2000	**604.81**	6.2	0.9	<.1	**40**	<25	0.2	<1	<1	19	7
12	6/6/2001	**604.76**	6.1	<.9	<0.1	**31.6**	7.5	<0.4	<1	<2.6	16	<1.9
12	12/7/2001	**605.16**	6.2	<.9	<0.1	**30**	<5	<0.4	<1	<2.6	24	<1.9
12	6/20/2002	**605.30**	6.3	3.4	**0.2**	**96.5**	**194**	<0.5	<0.7	<1.5	**84**	<1.3
12	12/19/2002	**607.64**	6.3	1.1	<14	**35.6**	**31.2**	<0.6	<1.3	<2.2	**54**	<3.1
12	6/10/2003	**609.98**	6.8	2.1	**3.0**	**60.5**	**41**	1.0	1.5	<2.9	**27**	12.5
12	12/2/2003	**607.52**	6.9	<0.5	**0.1**	13	<5.0	<0.5	<1.3	<2.9	22	10
12	6/22/2004	**606.81**	6.3	1.2	<0.063	19.3	<5.0	<0.5	<1.3	<2.9	18	43
12	12/14/2004	**607.90**	6.4	<0.27	<0.063	**35.6**	<5.0	<0.4	<0.9	<1.4	**28**	**74**
12	6/22/2005	**606.52**	6.4	1.4	**0.1**	14.3	<1	<0.2	<1	<1	13	16
12	12/14/2005	**606.52**	6.4	1.0	**0.04**	**33.4**	<5	0.2	<1	<1	18	8
12	6/14/2006	**606.28**	7.1	4.2	<0.1	**52.4**	<5	<0.2	<0.1	<0.1	26	16
12	12/19/2006	**606.88**	6.2	0.8	<0.10	**47.1**	<5	<0.2	<0.1	<0.1	18	16
12	4/26/2007	**608.08**	6.5	<1.0	<0.002	16	<20	0.034	1.4	<5	13	16
12	11/15/2007	**605.82**	6.7	9.4	<0.10	14.8	**95**	<0.5	<0.4	<4	13	11.2
12	4/24/2008	602.67	6.2	9.7	<0.10	**25.2**	<25	<1.0	<5.0	<5.0	15	21
12	10/24/2008	605.41	5.6	9.6	<0.10	24.1	<25.0	**1.2**	<5.0	<5.0	16	<10
12	5/18/2009	608.78	7.0	3.2	<0.01	**38.7**	**26**	<0.50	<0.40	<4.0	22	<0.4
12	10/29/2009	605.48	7.6	2.8	<0.10	23	<25.0	<1.0	<5.0	<5.0	20	14.6
12	4/13/2010	608.59	7.6	3.7	<0.10	**34.3**	<25.0	<1.0	<5.0	<5.0	14	<10
12	4/20/2011	608.86	6.2	0.3	**0.31**	**44.6**	<5	<1.0	--	--	19	<50
12	4/25/2012	607.37	6.7	0.57J	<0.030	15	<5	<1.0	--	--	17	<50
12	4/10/2013	607.05	5.7	1.0	<10	**28.6**	<5	<1.0	--	--	15	<50
12	4/22/2014	608.02	6.0	1.2	<10	**36.3**	<5	<1.0	--	--	16	7J

MW-13 (Downgradient from Sludge Ponds) 597.69 top of screen 16.67' TOC=611.15, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
13	8/5/92	598.25	5.7	1.7	< 1	23	12	**1.2**	1	1	**76**	nd
13	11/92	598.20	5.6	1.7	< 1	**31**	12	**1.1**	nd	1	**64**	nd
13	2/92	597.90	**5.3**	1.8	< 1	**26**	nd	**1**	2	nd	**46**	15
13	5/93	598.00	5.8	6.3	< 1	**32**	nd	**5**	nd	nd	**62**	10
13	4/95	594.77	6.0	1.4	**0.2**	22	nd	**0.6**	nd	3	**70**	10
13	10/95	585.70	**5.4**	1.5	nd	23	nd	**0.5**	nd	2	**71**	nd
13	6/5/97	585.79	6.1	1.8	< 1	24	nd	**1.6**	nd	nd	**103**	23
13	12/9/98	598.03	5.5	2.6	nd	23	**16**	**4.3**	nd	nd	**95**	19
13	6/17/1999	601.20	6.0	3.3	**0.2**	15	**20**	**1.0**	<1	<1	**235**	<5
13	12/9/1999	598.57	5.9	3.4	**0.1**	24	9	**2.7**	1	2	**139**	27
13	6/22/2000	598.74	6.1	4.8	<0.1	**27**	7	**2.2**	<1	<1	**152**	10
13	12/14/2000	598.73	6.0	4.8	<0.1	**30**	<25	**2.2**	<1	<1	**140**	15
13	6/6/2001	599.13	5.9	2.8	<0.1	**34**	<1	**3**	<1	<2.6	**122**	<1.9
13	12/7/2001	598.85	6.0	4.5	<0.1	**33**	<5	<0.4	<1	<2.6	**153**	30
13	6/20/2002	598.97	6.1	2.8	**0.4**	**38**	**166**	**4**	<0.7	<1.5	**120**	22
13	12/19/2002	607.64	6.2	3.4	<0.014	**37**	**21.5**	<0.6	<1.3	<2.2	**157**	<3.1
13	6/10/2003	600.57	6.1	4.9	**1.0**	**34**	<5	**1.0**	1.4	<2.9	**148**	25
13	12/2/2003	599.71	6.2	2.6	**0.2**	**40**	<5.0	**4.0**	2	<2.9	**168**	12
13	6/22/2004	599.95	6.0	5.2	<0.063	**37**	<5.0	**28.0**	<1.3	<2.9	**156**	**108**
13	12/13/2004	600.04	6.1	3.1	**0.12**	**38**	6.2	**2**	<0.9	<1.4	**185**	**438**
13	6/22/2005	599.54	6.1	4.0	**0.04**	**35**	<1	**0.5**	<1	<1	**149**	**31**
13	12/14/2005	599.54	6.3	4.26	**0.04**	**37.1**	<5	**1.5**	<1	<1	**163**	16
13	6/14/2006	599.57	6.6	18.9	<0.10	**35**	<5	<0.2	<1	<1	**160**	39
13	12/19/2006	599.70	6.2	3.98	**0.14**	**39**	<5	**0.8**	<1	<1	**145**	11
13	4/25/2007	600.18	6.4	3.3	<0.10	**35**	<20	**7.2**	0.76	<0.3	**100**	30
13	11/15/2007	599.53	6.2	**44.8**	<0.10	**36.8**	**61**	**9.1**	<0.4	<4	**79**	37.5
13	4/23/2008	600.26	6.1	**12**	<0.10	**36.6**	<25	**13.1**	<5.0	<5.0	**87**	23.4
13	10/22/2008	599.41	6.2	**29.4**	<0.10	**38.6**	<25.0	**13.1**	<5.0	<5.0	**94**	11.8
13	5/19/2009	600.86	6.8	**22.6**	<0.01	**37.2**	<25	**19.9**	<0.40	<0.4	**123**	<0.4
13	10/28/2009	599.60	7.6	**24**	<0.10	**38.3**	<25.0	**3.9**	<5.0	<5.0	**89**	12.3
13	4/13/2010	601.10	7.6	**22.6**	**0.43**	**39**	<25.0	**12**	<5.0	<5.0	**111**	13.5
13	4/20/2011	601.82	6.2	3.59	**0.25**	**34.9**	10	0.3	--	--	**162**	9
13	4/25/2012	600.43	6.2	4.05	**0.19**	**34.7**	<5	0.8J	--	--	**155**	5J
13	4/10/2013	600.82	6.1	4.41	**0.18**	**33.9**	<5	1.5	--	--	**144**	10J
13	4/22/2014	601.35	6.2	4.89	**0.13**	**31.6**	<5	<1.0	--	--	**145**	8J

MW-14 (Downgradient from Sludge Ponds) 595.39 top of screen 15.67' TOC=611.06, 10 ' long

Well	Date	SWE	pH	TOC	NH3	Chloride	Color	Cd	Cr	Pb	Na	Zn
		ft	SU	mg/l	mg/l	mg/l	ADMI CU (2)	ug/l	ug/l	ug/l	mg/l	ug/l
WQS			**5.5-8.5**	**10**	**0.025**	**25**	**15**	**0.4**	**50**	**50**	**25**	**50**
QL required by GWMP				**0.5**	**0.1**	**1**	**10**	**0.1**	**1**	**1**	**20**	**5**
14	8/5/92	**598.15**	6.0	1.4	< 1	**35**	12	0.4	nd	2	**53**	nd
14	11/92	**598.20**	**5.3**	2	< 1	**36**	**112**	**0.8**	nd	1	**84**	6
14	2/92	**597.90**	**5.4**	2.3	< 1	**30**	nd	**0.6**	2	nd	**57**	18
14	5/93	598.00	6.1	5.8	< 1	**32**	14	**3.2**	nd	1	**74**	8
14	4/95	598.61	6.0	1.8	**0.4**	**45**	nd	**1.2**	2	8	**82**	7
14	10/95	599.17	5.7	2	**0.7**	**38**	**32**	**1.6**	nd	2	**83**	nd
14	6/5/97	599.34	6.1	2.1	**0.4**	**34**	nd	**3.5**	nd	nd	**131**	28
14	12/9/98	598.61	5.7	3	**0.2**	**32**	nd	**1.5**	nd	nd	**142**	23
14	6/17/1999	599.16	6.1	3.5	**0.7**	25	**30**	0.2	<1	<1	**141**	<5
14	12/9/1999	599.31	6.0	3.8	**0.8**	**29**	**190**	**0.8**	3	3	**147**	35
14	6/22/2000	599.44	6.3	**19.6**	**0.8**	**32**	**250**	**1.4**	2	6	**141**	45
14	12/14/2000	599.24	6.2	4.6	**0.4**	**30**	<25	0.3	<1	<1	**130**	5
14	6/6/2001	599.61	6.1	3.7	**0.9**	**32**	<1	1.0	<1	<2.6	**128**	<1.9
14	12/7/2001	599.42	6.1	3.8	**0.8**	**34**	<5	<0.4	<1	<2.6	**145**	<1.9
14	6/20/2002	599.41	6.2	2.9	**1.0**	**37**	**169**	**6**	<0.7	<1.5	**121**	27
14	12/19/2002	600.11	6.1	3.0	**0.7**	**36**	9.0	**1.0**	< 1.3	<2.2	**164**	<3.1
14	6/10/2003	601.26	6.1	4.4	**1.3**	**34**	<5	<0.5	2.4	<2.9	**143**	9.3
14	12/2/2003	600.02	6.2	3.2	**1.1**	**36**	<5.0	<0.5	<1.3	<2.9	**185**	**165**
14	6/22/2004	599.86	5.9	4.7	**0.7**	**37**	<5.0	<0.5	<1.3	<2.9	**161**	**98**
14	12/13/2004	600.31	6.1	3.2	**1.0**	**38**	<5.0	<0.4	<1.3	<1.4	**203**	**392**
14	6/22/2005	599.95	6.2	6.7	**2.3**	**35**	<1	<0.2	<1	<1	**162**	44
14	12/14/2005	600.61	6.4	5.8	**0.97**	**40.1**	<5	0.40	<1	<1	**183**	10
14	6/14/2006	599.79	6.8	7.0	**1.23**	**37.3**	**50**	<0.2	<1	<1	**185**	18
14	12/19/2006	600.04	6.3	7.1	**1.75**	**41.9**	<5	0.20	<1	<1	**179**	20
14	4/25/2007	600.48	6.4	5.3	**1.0**	**40**	**103**	0.71	0.61	<5.0	**100**	25
14	10/25/2007	599.54	6.3	**34.0**	**1.1**	**39.8**	**47**	<0.5	<0.4	<4	**82**	25.5
14	4/24/2008	600.51	6.1	**13.7**	**1.1**	**41.1**	<25	<1.0	<5.0	<5.0	**94**	37.7
14	10/24/2008	599.77	6.2	**5.0**	**1.2**	**41.8**	<25.0	**1.4**	<5.0	<5.0	**146**	30.5
14	5/19/2009	601.13	6.5	**28.2**	**1.4**	**40**	<25	<.5	<0.40	<4.0	**156**	10.6
14	10/28/2009	599.9	7.6	**24.4**	**1.4**	**41.3**	<25.0	<1.0	<5.0	<5.0	**162**	14.4
14	4/13/2010	601.52	7.6	**11.8**	**1.6**	**43.7**	<25.0	**4.4**	<5.0	<5.0	**153**	**174**
14	4/20/2011	602.06	6.2	4.8	**1.76**	**39.3**	10	**0.9**	--	--	**215**	7
14	4/25/2012	600.58	6.3	5.7	**2.08**	**40.5**	<5	**0.5J**	--	--	**256**	20
14	4/10/2013	601.21	6.1	5.8	**1.94**	**40.3**	<5	<0.2	--	--	**187**	8J
14	4/22/2014	601.53	6.2	5.8	**1.96**	**36.5**	<5.0	<1.0	--	--	**192**	10J

SM-1 (Reed Creek, approximately 25 ft upstream of convergence with James River)

Well	Date	pH	TOC	Chloride	Na
		SU	mg/l	mg/l	mg/l
WQS		**5.5-8.5**	**10**	**25**	**25**
QL required by GWMP			**0.5**	**1**	**20**
1	06/17/99	8.0	2.4	2	2
1	12/09/99	8.3	1.6	4	9
1	06/27/00	7.4	2.8	4	3

SM-2 (Reed Creek, approximately 10 ft downstream of RR treacle adjacent to Rt. 501)

Well	Date	pH	TOC	Chloride	Na
		SU	mg/l	mg/l	mg/l
WQS		**5.5-8.5**	**10**	**25**	**25**
QL required by GWMP			**0.5**	**1**	**20**
2	06/17/99	8.4	2.8	2	2
2	12/09/99	6.7	1.6	3	5
2	06/27/00	7.7	2.5	5	3

SM-3 (Long Branch Creek, approximately 25 ft upstream of the convergence with James River)

Well	Date	pH	TOC	Chloride	Na
		SU	mg/l	mg/l	mg/l
WQS		**5.5-8.5**	**10**	**25**	**25**
QL required by GWMP			**0.5**	**1**	**20**
3	06/17/99	7.9	2.3	2	2
3	12/09/99	6.8	1.0	2	3
3	06/27/00	7.8	1.6	2	2

SM-4 (Long Branch Creek, at the site fence line and creek bend downstream of the RR tracks adjacent to Rt. 501)

Well	Date	pH	TOC	Chloride	Na
		SU	mg/l	mg/l	mg/l
WQS		**5.5-8.5**	**10**	**25**	**25**
QL required by GWMP			**0.5**	**1**	**20**
4	06/17/99	8.2	2.3	1	2
4	12/09/99	7.7	1.0	2	2
4	06/27/00	7.8	1.6	2	2

Notes:

(1) Denotes that sample was filtered prior to analysis, all metals are dissolved
underlined parameters are criteria
Bold elevation indicates that groundwater was above the top of the screen at sampling
(2) Data beginning 12/14/00 completed by SM 2120 E(4) rather than 2120B
Bold data indicates values about water quality standards

Estimated elevation of polishing pond bottom:
610 road elevation from SW maps
-2.5 distance from road to water
-6.5 depth given in SMP
601 estimated elevation of pond bottom

Estimated elevation of primary pond bottom:
620 berm elevation from SW maps
-2.5 distance from berm to water
-10.5 depth given in SMP
607 estimated elevation of pond bottom

Estimated elevation of sludge pond bottom:
track side basin
605.4 water level from 9-14-94 GWM report fromOlver
-3 depth
602.4 estimated elevation of pond bottom

river side basin:
607.7 water level from 9-14-94 GWM report from Olver
-6 depth
601.7 estimated elevation of pond bottom

PREPARED FOR:
GEORGIA-PACIFIC CORPORATION
HIGHWAY 501 NORTH
P.O. BOX 40
BIG ISLAND, VIRGINIA 24526
804-299-5911

GEORGIA-PACIFIC CORPORATION
WASTEWATER TREATMENT FACILITIES
BEDFORD COUNTY, VIRGINIA
VPDES PERMIT NO. 0003026

GROUNDWATER MONITORING PROGRAM

PATRICK MOORE
ENVIRONMENTAL MANAGER

ORIGINAL SUBMITTAL 2/28/90

REVISION 1: 8/23/91

REVISION 2: 3/2/94

REVISION 3: 11/29/01

REVISION 3
PREPARED BY:

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4808 RADFORD AVENUE
RICHMOND, VIRGINIA 23230
PHONE: 804.355.4520
FAX: 804.355.4282
WWW.JOYCEENGINEERING.COM
JEI PROJECT NO. 395.15

Georgia-Pacific Corporation
Waste Water Treatment Plant, VPDES Permit No. 0003026
Groundwater Monitoring Plan
Table of Contents

DRAWINGS

EXHIBITS

I. INTRODUCTION AND PURPOSE

The purpose of this program is to determine if activities at the site are in compliance with the Virginia Department of Environmental Quality's (DEQ) Water Quality standards (9VAC25-260-190) pertaining to Groundwater Standards.

This program when approved by the West Central Regional Office of the DEQ shall become an enforceable condition of VPDES Permit No. 0003026 (reissued June 2000).

When the mill's wastewater treatment system was constructed in 1976-77 Wiley and Wilson, Consulting Engineers of Lynchburg, Virginia designed the Aeration and Final Settling Basins. Wiley and Wilson subcontracted Sayre and Sutherland, Inc. of Richmond, Virginia to perform a Geotechnical Study of the area and designed the dikes and bottoms based on that study.

The dikes are 12' wide at the top with a graveled roadway. Sides of the dikes have a 2 ½ to 1 slope. Dikes are constructed of compacted clay soil having dikes suitale low permeability, compacted to 95% (per standard Proctor ASTM D698).

The basin bottoms were sealed with similarly compacted clay soils to a 90% minimum (per standard Proctor ASTM D698).

Rip-rap and vegetation was strategically placed to provide protection from erosion, mechanical aerator action, etc. (A copy of the specifications is attached as Exhibit 1.)

When the Primary Equalization Basins were constructed in 1978 G-P (then Owens-Illinois) contracted Sayre and Associates of Richmond, VA to conduct a Geotechnical Study of that area. Mill engineers designed and built the primary equalization basins based on the Geotechnical Study results and with the same specifications used for the Aeration-Polishing Basins.

Again in 1979 when the Sludge Dewatering Basins were constructed geotechnical data provided by Sayre and Sutherland was used along with the same construction specifications as used for the Aeration & Polishing Basins.

II. THE PROGRAM

Initial assessments and continuing monitoring for each treatment area will be as follows: (A layout of wastewater treatment system is displayed on Drawing 1.)

1.0 Primary Equalization Basins:

1.1 Three monitoring wells (MW-6, MW-7, and MW-8) monitor the uppermost water bearing zone (WBZ) beneath the equalization basin, one upgradient (MW-6) for background ground water quality and two downgradient (MW-7 and MW-8) to detect any potential contaminant releases (see Drawing 1). Monitoring well boring logs and construction information are displayed in Exhibit 2. Semi-annual monitoring events are conducted to monitor water quality within the WBZ beneath the Primary Equalization Basins. Each well is tested for the following:

1. Water level
2. pH

3. Conductivity

4. Soluble Sodium

5. Chloride

6. TOC

7. Soluble Cadmium

8. Soluble Chromium

9. Soluble Lead

10. Soluble Zinc

11. Ammonia

12. Color

Metal analyses will be performed on groundwater samples that have been field filtered using a 0.45-micron filter. The method numbers and parameters are listed in Exhibit 3. After monitoring for 1 year, modifications to the parameter list may be requested by Georgia-Pacific and considered by the DEQ.

2.0 Aeration Basin and Final Settling Basin:

(These 2 basins are to be evaluated together as they share common dikes).

2.1 In accordance with Fact Sheet (#10) for the VPDES permit reissued on June 29, 2000, surface water monitoring for Reed Creek and Long Branch are no longer required.

2.2 Three monitoring wells MW-9R, MW-10, and MW-11 monitor the WBZ beneath the aeration basin and final settling basin, one upgradient (MW-9R) for background groundwater quality and two downgradient (MW-10 and MW-11) to detect any potential contaminant releases (see Drawing 1). Monitoring well boring logs and construction information are displayed in Exhibit 2. Semi-annual monitoring events are conducted to monitor the water quality of the WBZ beneath the aeration and final settling basins. Each well shall be tested for the following:

1. Water level
2. pH
3. Conductivity
4. Soluble Sodium
5. Chloride
6. TOC
7. Soluble Cadmium
8. Soluble Chromium
9. Soluble Lead
10. Soluble Zinc
11. Ammonia
12. Color

Metal analyses will be performed on groundwater samples that have been field filtered using a 0.45-micron filter. The method numbers and parameters are listed

in Exhibit 3. After monitoring for 1 year modifications to the parameter list may be requested by Georgia-Pacific and considered by the DEQ.

3.0 Sludge Lagoons:

3.1 In accordance with Fact Sheet (#10) for the VPDES permit reissued on June 29, 2000, surface water monitoring of Cabin Creek is no longer required.

3.2 Three monitoring wells MW-12, MW-13, and MW-14 monitor the WBZ beneath the sludge dewatering basins, one upgradient (MW-12) for background ground water quality and two downgradient (MW-13 and MW-14) to detect any potential contaminant releases (see Drawing 1). Monitoring well boring logs and construction information are displayed in Exhibit 2. Semi-annual monitoring events are conducted to monitor the water quality of the WBZ beneath the Sludge Lagoons. Each well shall be tested for the following:

1. Water level
2. pH
3. Conductivity
4. Soluble Sodium
5. Chloride
6. TOC
7. Soluble Cadmium
8. Soluble Chromium
9. Soluble Lead

10. Soluble Zinc

11. Ammonia

12. Color

Metal analyses will be performed on groundwater samples that have been field filtered using a 0.45-micron filter. The method numbers and parameters are listed in Exhibit 3. After monitoring for 1 year modifications to the parameter list may be requested by Georgia-Pacific and considered by the DEQ.

III. REPORTING

Semi-annual reporting of groundwater monitoring events will be submitted to the West Central Regional Office of the DEQ with the monthly DMR within 60 days after the calendar quarter collected. The report will include static water elevations of monitoring wells.

IV. SCHEDULE FOR MONITORING WELL INSTALLATION

1. Future groundwater monitoring wells shall be installed and developed within three (3) months of approval by the DEQ. A well completion report documenting the well design and construction will be submitted within 45 days of installation. The West Central Regional Office of the DEQ will be notified 5 days prior to the date of the well installation.

2. Groundwater monitoring shall commence within 45 days of the installation of the groundwater monitoring wells.

EXHIBIT 3

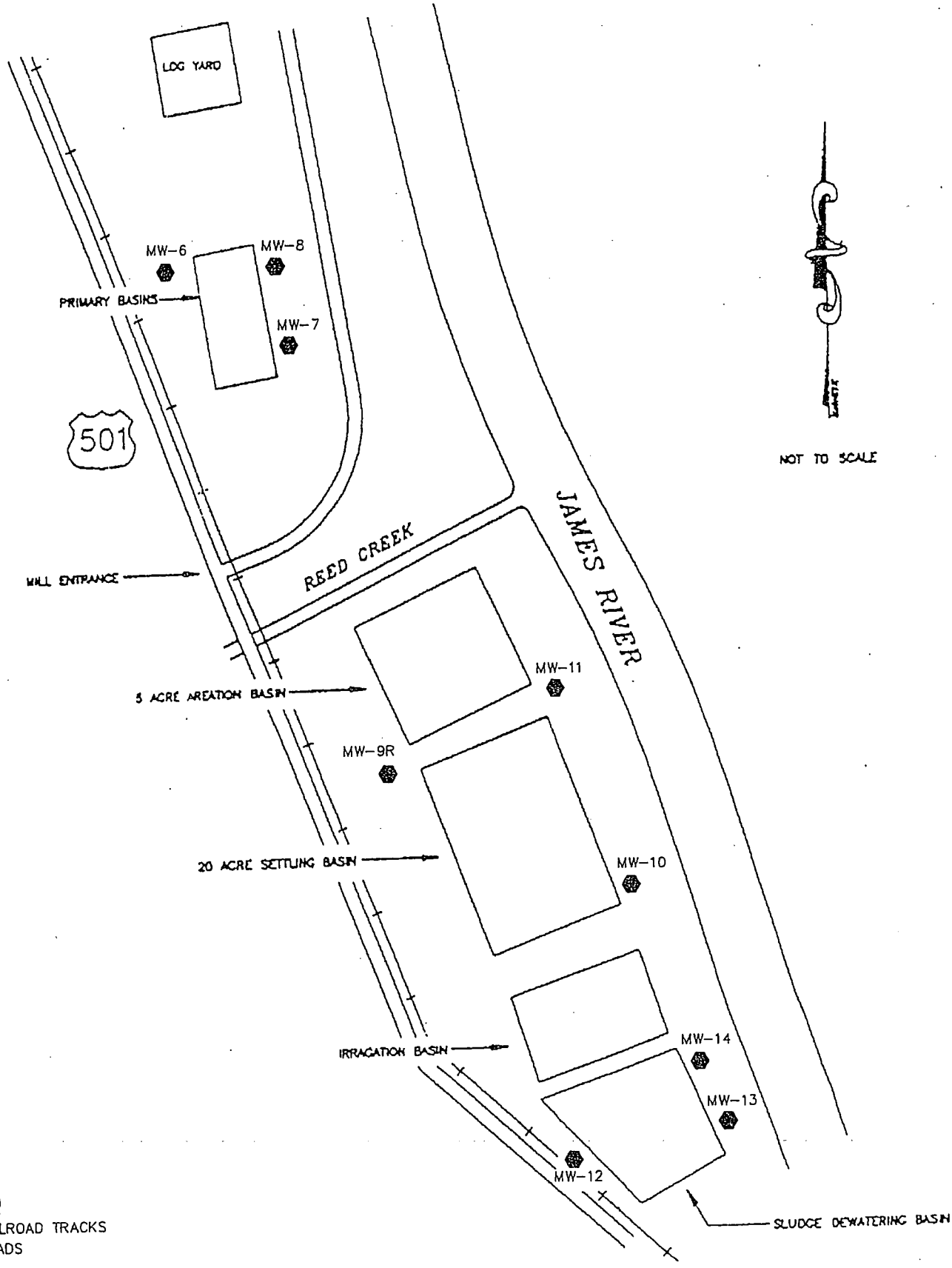
ATTACHMENT C

PARAMETER LIST (See permit for amended list)
GEORGIA-PACIFIC CORPORATION
WWTP LAGOONS, VPDES Permit No. 0003026

Analyte	SW-846 Method	MDL, µg/L	PQL, µg/L
pH (Field, 4 determinations)	9040	(a)	(a)
Conductivity (Field, 4 determinations)	9050	(b)	(b)
TOC (Single determination)	9060	500	2500
Chloride	9252	1000	5000
Color(e)	110.1(c)	1 Units	N/A
Ammonia	4500 (d)	200	1000
Soluble Cadmium	7131	0.1	1
Soluble Chromium	7191	1	10
Soluble Lead	7421	1	10
Soluble Sodium	6010	10	50
Soluble Zinc	6010	5	50

[a]pH will be measured to the nearest 0.01 Standard Unit.
[b]Conductivity will be measured to the nearest 10µmhos/cm.
[c]Methods for the Chemical Analysis of Water and Wastes, USEPA, March 1983.
[d]Standard Methods for the Examination of Water and Wastewater, 17th Edition.
[e]Color results will be reported in ADMI units.
MDL = Mean Detection Limit.
PQL = Practical Quantitation Limit.
N/A = Not Available.

January 11, 1994
Revised October 15, 2001



LEGEND

RAILROAD TRACKS

ROADS

MW-9R MONITORING WELL LOCATION AND IDENTIFICATION

7/9/01	JOYCE ENGINEERING, INC.	4808 RADFORD AVENUE RICHMOND, VA 23230-3506 PHONE: (804) 355-4520	SCALE N.T.S.	PROJECT NO. 395.15	SITE PLAN DRAWING #1 GEORGIA-PACIFIC CORP. BIG ISLAND, VA WASTE WATER TREATMENT FACILITY

H:\DWGS\G-pacific\BIG ISLAND\SITE2 dwg\layout1

Attachment G

Outfall Data

- **Stormwater Data**

<u>Outfall 002</u>

- **pH, Temperature, and Hardness Data**

<u>Outfall 003</u>

- **pH, Temperature, and Hardness Data**
- ***E. coli Data***
- **Ammonia Data**
- **Total PCBs Data**
- **Water Quality Standards Monitoring Data**

Stormwater Data

Outfall 005
(sw runoff from loading and unloading areas for rail and truck)

Sample Date	BOD_5 (mg/L)	TKN (mg/L)	TSS (mg/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**1.5**	**100**	**1.76**	**120**	**-**	**15**
7/3/14 (g)	**31**	**71.2**	**483**	1.260	**424**	1.22	<5.00
7/3/14 (c)	10	0.895	35.0	0.784	45.5	0.16	

Outfall 012
(sw drainage from parking lot, roadway drains, sediment trap from OCC pad)

Sample Date	BOD_5 (mg/L)	TSS (mg/L)	TKN (mg/L)	COD (mg/L)	NO_2/NO_3 (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**100**	**1.5**	**120**	**1.76**	**-**	**15**
10/25/10 (g)	11	50	1.4				
8/13/11 (g)	9	44	1.0				
9/17/12 (g)	11	10	1.45				
9/21/13 (g)	5	43	1.48				
7/3/14 (g)	16	57.2	1.07	104	0.373	0.17	<5.00
7/3/14 (c)	14	12.1	1.20	62.2	1.5	0.13	

Outfall 014
(sw runoff from truck scale area, parking area, and main road)

Sample Date	BOD_5 (mg/L)	COD (mg/L)	TSS (mg/L)	Diss. Cu (ug/L)	Total Recov. Cu (ug/L)	TKN (mg/L)	NO_2/NO_3 (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**120**	**100**	**18**	**18**	**1.5**	**1.76**	**-**	**15**
9/26/10 (g)				**19**					
10/14/10 (g)	**129**	**677**	**133**	**34**		**25.2**			
11/15/10 (g)		181				**2.2**			
2/24/11 (g)					12				
4/16/11 (g)					6				
8/13/11 (g)	20	**427**	32		**19**	**19**			
9/20/11 (g)		**644**				**30.0**			
10/19/11 (g)					**23**				
2/29/12 (g)				10					
5/21/12 (g)				4					
8/4/12 (g)				4					
9/17/12 (g)	12	103	53			**1.69**			
11/12/12 (g)				6					
2/26/13	5				6				
4/4/13					5				
7/20/13					8				
9/21/13	5	60	86			0.94			
11/26/13					14				
7/3/14 (g)	18	101	87.5		9.19	0.86	0.262	0.12	<5.00
7/3/14 (c)	13	84.5	28.3		9.77	0.944	0.478	0.18	

Outfall 015
(sw runoff from linerboard roof and around linerboard facility)

Sample Date	BOD_5 (mg/L)	TKN (mg/L)	TSS (mg/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**1.5**	**100**	**1.76**	**120**	**-**	**15**
10/25/10 (g)	18	**4.4**					
10/19/11 (g)	12	**3.7**					
12/17/12 (g)	23	**2.17**					
9/21/13 (g)	5	1.09					
7/3/14 (g)	7	1.02	40.6	0.264	39.9	0.13	<5.00
7/3/14 (c)	7	1.33	74.6	0.595	62.2	0.34	

Outfall 017
(sw runoff from equalization basin area and main access road)

Sample Date	BOD_5 (mg/L)	COD (mg/L)	TSS (mg/L)	TKN (mg/L)	NO_2/NO_3 (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**120**	**100**	**1.5**	**1.76**	**-**	**15**
10/14/10	14	80	**297**	1.7			
11/16/05			85				
10/19/11	2	50	22	1.1			
12/6/11	2						
9/18/12	7	57	48	2.1			
9/21/13	9	43	41	**1.83**			
7/3/14 (g)	18	**241**	**817**	**2.74**	0.921	0.68	<5.00
7/3/14 (c)	8	76.2	7.68	**1.52**	0.999	0.45	

Outfall 018
(sw runof from between equalization basins and main entrance)

Sample Date	BOD_5 (mg/L)	TSS (mg/L)	TKN (mg/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**100**	**1.5**	**1.76**	**120**	**-**	**15**
11/30/10	3	27	1.0				
10/19/11	10	75	**2.4**				
11/12/12	3	97	**1.02**				
9/21/13	<5.0	**129**	0.64				
11/26/13	<5.0						
7/3/14 (g)	5	46.4	0.51	0.222	28.8	0.1	
7/13/14 (c)	17	9.18	**1.93**	**4.13**	87.3	0.28	

Outfall 021

(sw drainage from truck and rail unloading area, outdoor secondary fiber storage area, and 1,000 gallon propane tank)

Sample Date	BOD_5 (mg/L)	TSS (mg/L)	Diss. Zn (ug/L)	TKN (mg/L)	Total Recov. Zn (ug/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**100**	**120**	**1.5**	**120**	**1.76**	**120**	**-**	**15**
9/26/10 (g)			**179**						
10/19/10 (g)	**49**	76	**325**	**4.1**					
2/24/11 (g)					73				
4/16/11 (g)					49				
8/13/11 (g)	23	95		1.4	**319**				
9/20/11 (g)					**196**				
10/19/11 (g)					**206**				
2/29/12 (g)					**138**				
5/21/12 (g)					77				
8/4/12 (g)					74				
9/18/12 (g)	23	31							
11/12/12 (g)					**150**				
2/26/13 (g)					50				
4/4/13 (g)					**222**				
7/20/13 (g)					76				
9/21/13 (g)	13	61		0.8					
10/7/13 (g)					54				
7/3/14 (g)	27	**421**		**3.65**	**333**	0.334	**277**	0.75	<5.00
8/1/14 (c)	19	12.2		0.154	<50	0.154	59.4	0.12	

Outfall 555

(generated from samples taken from outfalls 007, 009, 010, and 013)

(outfall 007 drains sw from loading and unloading areas for rail and trucks)

(outfall 009 drains sw from roadway drainage)

(outfall 010 drains sw from parking lot and main entrance road)

(outfall 013 drains sw from roadway, old truck scales, and parking lot)

Sample Date	BOD_5 (mg/L)	TSS (mg/L)	TKN (mg/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**30**	**100**	**1.5**	**1.76**	**120**	**-**	**15**
10/25/10 (007)	3	13	0.3				
10/19/11 (009)	23	30	10.3				
9/18/12 (010)	5	87	0.69				
9/21/13 (013)	<5.0	41	0.74				
7/3/14 (g) (007)	6	8.1	0.559	0.474	26.0	0.06	<5.00
8/1/14 (c) (007)	8	2.00	<0.50	0.0980	<10.0	<0.05	

Outfall 022
(sw outfall from sediment basin at Amherst landfill)

Sample Date	TSS (mg/L)	NO_2/NO_3 (mg/L)	Total Recov. Iron (mg/L)	BOD_5 (mg/L)	TKN (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**100**	**1.76**	**1.0**	**30**	**1.5**	**120**	**-**	**15**
11/30/10 (g)	23	0.3	**11**					
10/19/11 (g)	32	1.68	**3.2**					
12/20/12 (g)	13	<0.1	**5.4**					
10/7/13 (g)	14	0.20	**4.9**					
7/3/14 (g)	79.3	0.147		16	1.12	23.2	0.46	<5.00
7/3/14 (c)	14.4			4	0.535	31.6	0.09	

Outfall 023
(sw drainage from haul road near Amherst landfill entrance)

Sample Date	COD (mg/L)	TSS (mg/L)	Total Recov. Iron (mg/L)	TKN (mg/L)	NO_2/NO_3 (mg/L)	P, Total (mg/L)	O&G (mg/L)	BOD_5 (mg/L)
Screening Criteria	**120**	**100**	**1.0**	**1.5**	**1.76**	**-**	**15**	**30**
11/30/10 (g)	30	5	**5**	0.9				
10/19/11 (g)	68	63	3.7	**1.6**				
12/20/12 (g)	12	**213**	86	**2.54**				
10/7/13 (g)	70	40	2.34	**2.12**				
7/3/14 (g)	**185**	**713**		**2.27**	0.715	1.07	<5.00	11
7/13/14 (c)		**69.1**	**1.81**	0.924	0.930	0.30		4

Outfall 025
(sw runoff from lowest point on Amherst landfill haul road)

Sample Date	TSS (mg/L)	Recov. Iron (mg/L)	TKN (mg/L)	BOD_5 (mg/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**100**	**1.0**	**1.5**	**30**	**1.76**	**120**	**-**	**15**
11/30/10 (g)	4	0.3	0.4					
10/19/11 (g)	57	**1.6**	0.6					
12/17/12 (g)	**430**	**6.7**	0.39					
6/18/13 (g)	85							
11/26/13 (g)	**181**	**8.7**	1.15					
7/3/14 (g)	**3080**		**10.1**	**35**	0.318	**782**	4.39	10.0
7/3/14 (c)	**123**	**4.7**	0.652	<2	0.195	23.2	0.16	

Outfall 028
(sw from sw basin receiving runoff from Phase III cells of Amherst landfill)

Sample Date	TSS (mg/L)	Total Recov. Iron (mg/L)	TKN (mg/L)	BOD_5 (mg/L)	NO_2/NO_3 (mg/L)	COD (mg/L)	P, Total (mg/L)	O&G (mg/L)
Screening Criteria	**100**	**1.0**	**1.5**	**30**	**1.76**	**120**	-	**15**
11/30/10 (g)	13	**20**						
10/19/11 (g)	89	**22**						
12/20/12 (g)	69	**23**						
11/26/13 (g)	92	**52**						
7/3/14 (g)	**426**		**2.11**	11	0.407	**132**	0.69	<5.0
7/3/14 (c)	**782**	**159**	**1.55**	7	0.314	110	1.58	

GP Big Island
VA0003026

Stormwater pH Data (Outfall 012)

Date	S.U.	
	Min.	Max.
10-Jul-10	6.5	7.0
10-Jul-11	7.8	7.8
10-Jul-12	7.1	7.1
10-Jul-13	7.4	7.4
10-Jul-14	7.6	7.6

minimum	6.5	S.U.
maximum	7.8	S.U.

GP Big Island
VA0003026

Stormwater pH Data (Outfall 014)

Date	S.U.	
	Min.	Max.
10-Jul-10	6.8	7.6
10-Jul-11	7.2	7.2
10-Jul-12	6.3	6.3
10-Jul-13	7.1	7.1
10-Jul-14	7.6	7.6

minimum	6.3	S.U.
maximum	7.6	S.U.

GP Big Island
VA0003026

Stormwater pH Data (Outfall 018)

Date	S.U.	
	Min.	Max.
10-Jul-10	6.4	6.4
10-Jul-11	7.8	7.8
10-Jul-12	8.1	8.1
10-Jul-13	6.2	6.2
10-Jul-14	8.1	8.1

minimum	6.2	S.U.
maximum	8.1	S.U.

GP Big Island
VA0003026

Stormwater pH Data (Outfall 021)

Date	S.U.	
	Min.	Max.
10-Jul-10	6.5	6.5
10-Jul-11	6.6	6.6
10-Jul-12	7.9	7.9
10-Jul-13	6.8	6.8
10-Jul-14	7.6	7.6

minimum	6.5	S.U.
maximum	7.9	S.U.

GP Big Island
VA0003026

Stormwater pH Data (Outfall 555)

Date	S.U.	
	Min.	Max.
10-Jul-10	6.3	6.5
10-Jul-11	7.7	7.7
10-Jul-12	7.3	7.3
10-Jul-13	8.1	8.1
10-Jul-14	7.5	7.5

minimum	6.3	S.U.
maximum	8.1	S.U.

GP Big Island
VA0003026

Effluent Temperature -- Outfall 002

Date Due	°C
10-Nov-11	32
10-Dec-11	24
10-Jan-12	19
10-Feb-12	18
10-Mar-12	21
10-Apr-12	28
10-May-12	28
10-Jun-12	32
10-Jul-12	35
10-Aug-12	38
10-Sep-12	36
10-Oct-12	34
10-Nov-12	27
10-Dec-12	19
10-Jan-13	20
10-Feb-13	20
10-Mar-13	18
10-Apr-13	19
10-May-13	30
10-Jun-13	36
10-Jul-13	36
10-Aug-13	38
10-Sep-13	36
10-Oct-13	35
10-Nov-13	32
10-Dec-13	25
10-Jan-14	22
10-Feb-14	20
10-Mar-14	18
10-Apr-14	20
10-May-14	27
10-Jun-14	36
10-Jul-14	40
10-Aug-14	39
10-Sep-14	37
10-Oct-14	39

90th Percentile Temperature	38 °C
90th Percentile Temperature (January - May)	34 °C

GP Big Island
VA0003026

Effluent pH (S.U.) -- Outfall 002

Date Due	min	max
10-Nov-11	7.6	8.2
10-Dec-11	7.2	7.9
10-Jan-12	7.5	8
10-Feb-12	7.6	8
10-Mar-12	7.7	8.2
10-Apr-12	7.7	8
10-May-12	7.7	8.3
10-Jun-12	7.6	8.1
10-Jul-12	7.7	8.2
10-Aug-12	7.3	8.2
10-Sep-12	7.6	8.1
10-Oct-12	7.6	8.3
10-Nov-12	7.5	8
10-Dec-12	7.2	8
10-Jan-13	7.6	8
10-Feb-13	7.5	8
10-Mar-13	7.5	8
10-Apr-13	7.5	8
10-May-13	7.6	8.1
10-Jun-13	7.6	8
10-Jul-13	7.7	8
10-Aug-13	7.6	7.9
10-Sep-13	7.5	7.8
10-Oct-13	7.5	7.9
10-Nov-13	7.5	7.8
10-Dec-13	7.4	7.9
10-Jan-14	7.5	7.9
10-Feb-14	7.6	8
10-Mar-14	6.8	7.8
10-Apr-14	7.4	8
10-May-14	7.4	8
10-Jun-14	7.1	8.1
10-Jul-14	7.7	8
10-Aug-14	7.7	8
10-Sep-14	7.8	8.1
10-Oct-14	7.7	8

90th Percentile pH	8.2	S.U.
10th Percentile pH	7.3	S.U.

GP Big Island
VA0003026

Hardness Composite -- Outfall 002

Date	mg/L as $CaCO_3$
07/25/05	122
07/27/05	125
07/29/05	123
08/14/06	169
08/16/06	161
08/18/06	163
04/23/07	56
04/24/07	60
04/25/07	56
04/27/07	88
04/21/08	96
04/22/08	84
04/24/08	68
05/19/09	52
05/20/09	56
05/22/09	64
Mean	96

GP Big Island
VA0003026

Effluent Temperature -- Outfall 003

Date Due	°C
10-Nov-11	24
10-Dec-11	20
10-Jan-12	20
10-Feb-12	17
10-Mar-12	18
10-Apr-12	25
10-May-12	23
10-Jun-12	28
10-Jul-12	29
10-Aug-12	30
10-Sep-12	28
10-Oct-12	27
10-Nov-12	23
10-Dec-12	18
10-Jan-13	19
10-Feb-13	20
10-Mar-13	14
10-Apr-13	18
10-May-13	25
10-Jun-13	30
10-Jul-13	29
10-Aug-13	32
10-Sep-13	30
10-Oct-13	29
10-Nov-13	26
10-Dec-13	20
10-Jan-14	19
10-Feb-14	14
10-Mar-14	14
10-Apr-14	16
10-May-14	22
10-Jun-14	28
10-Jul-14	30
10-Aug-14	31
10-Sep-14	30
10-Oct-14	30

90th Percentile Temperature	30 °C
90th Percentile Temperature (January - May)	28 °C

GP Big Island
VA0003026

Effluent pH (S.U.) -- Outfall 003

Date Due	min	max
10-Nov-11	7.6	8.2
10-Dec-11	7.2	7.9
10-Jan-12	7.5	8
10-Feb-12	7.6	8
10-Mar-12	7.7	8.2
10-Apr-12	7.7	8
10-May-12	7.7	8.3
10-Jun-12	7.6	8.1
10-Jul-12	7.7	8.2
10-Aug-12	7.3	8.2
10-Sep-12	7.6	8.1
10-Oct-12	7.6	8.3
10-Nov-12	7.5	8
10-Dec-12	7.2	8
10-Jan-13	7.6	8
10-Feb-13	7.5	8
10-Mar-13	7.5	8
10-Apr-13	7.5	8
10-May-13	7.6	8.1
10-Jun-13	7.6	8
10-Jul-13	7.7	8
10-Aug-13	7.6	7.9
10-Sep-13	7.5	7.8
10-Oct-13	7.5	7.9
10-Nov-13	7.5	7.8
10-Dec-13	7.4	7.9
10-Jan-14	7.5	7.9
10-Feb-14	7.6	8
10-Mar-14	6.8	7.8
10-Apr-14	7.4	8
10-May-14	7.4	8
10-Jun-14	7.1	8.1
10-Jul-14	7.7	8
10-Aug-14	7.7	8
10-Sep-14	7.8	8.1
10-Oct-14	7.7	8

90th Percentile pH	8.2	S.U.
10th Percentile pH	7.3	S.U.

GP Big Island
VA0003026

Hardness Composite -- Outfall 003

Date	mg/L as $CaCO_3$
05/09/14	181
05/07/14	199
05/05/14	211
05/17/13	185
05/15/13	179
05/13/13	209
05/25/12	157
05/23/12	158
05/21/12	159
05/27/11	138
05/25/11	135
05/23/11	142
04/22/10	234
04/20/10	224
04/19/10	212
Mean	182

GP Big Island
VA0003026

Effluent Ammonia (Outfall 003)

Date	Result (mg/L)
9/17/2013	0.78
10/15/2013	<0.10
11/12/2013	<0.10
12/17/2013	0.66
2/25/2014	<0.10
5/13/2014	0.48

GP Big Island
VA0003026

Water Quality Standards Data Above Method Detection Level (Outfall 003)

Parameter	(ug/L)	Date Sampled	Acute AWLA	Chronic AWLA	Human Health
chromium, total	2.1 J	6/24/14			
nickel, total	2.6 J	6/24/14	550	110	
zinc, total	5.5 J	6/24/14	350	660	
cyanide	1.2 J	6/24/14	61	27	
phenol	1.0 J	6/24/14			1,800,000
bis(2-ethylhexyl)phthalate	30.6	6/24/14			2.2

J = result is less than the PQL but greater than the MDL and the reported result is an estimate

Effluent Bacteria (Outfall 003)

Parameter	Result	Units	Date Sampled
fecal coliform	13	C/100 mL	9/9/14
E. coli	10	MPN/100 mL	9/9/14

GP Big Island
VA0003026

Total PCBs

Location	Date	Result (pg/L)
Outfall 003	7/17/2013	1,532.92
Clarifier	7/17/2013	88,073.32
James River Intake	11/12/2013	505.49

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 12:00:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-01A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 GRAB	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
PHENOLS			**Method: EPA 604**				**Analyst: CL**	
2,4,6-Trichlorophenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
2,4-Dichlorophenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
2,4-Dimethylphenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
2,4-Dinitrophenol	ND	NA	0.0069	NA		mg/L	7/2/2014 6:22 PM	
2-Chlorophenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
2-Nitrophenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
4,6-Dinitro-2-methylphenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
4-Chloro-3-methylphenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
4-Nitrophenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
Pentachlorophenol	ND	NA	0.0014	NA		mg/L	7/2/2014 6:22 PM	
Phenol	0.0010	NA	0.0014	NA	J	mg/L	7/2/2014 6:22 PM	
Surr: 2,4-Dibromophenol	85.4	NA	21.2-158	NA		%REC	7/2/2014 6:22 PM	

Notes:

Insufficient sample was available to prepare and analyze a matrix spiked quality control sample. Accuracy assessment was based on a lab control sample.

OIL and GREASE			**Method: EPA 1664 Rev. A**				**Analyst: KS**	
Oil & Grease	ND	NA	5.0	NA		mg/L	6/25/2014 11:00 AM	PA/VA
Cyanide			**Method: EPA 335.4, Rev. 1 (1993)**				**Analyst: BS**	
Cyanide, Total	0.012	NA	0.020	NA	J	mg/L	6/26/2014 12:32 PM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 1:00:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-02A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 LAB COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
ACROLEIN BY E624			**Method: EPA 624**				**Analyst: RB**	
Acrolein	ND	NA	50	NA		µg/L	6/27/2014 3:42 PM	PA/VA

Notes:

Elevated PQLs are due to matrix interference. Sample foamed during analysis.

The sample was improperly preserved for acrolein at pH<2.

VOLATILE ORGANIC COMPOUNDS			**Method: EPA 624**			**Analyst: RB**	
1,1,1,2-Tetrachloroethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA
1,1,1-Trichloroethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,1,2,2-Tetrachloroethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,1,2-Trichloroethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,1-Dichloroethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,1-Dichloroethene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,1-Dichloropropene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
1,2,3-Trichlorobenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
1,2,3-Trichloropropane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
1,2,4-Trichlorobenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
1,2,4-Trimethylbenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
DBCP	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA
1,2-Dibromoethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA
1,2-Dichlorobenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,2-Dichloroethane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,2-Dichloropropane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,3,5-Trimethylbenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
1,3-Dichlorobenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
1,3-Dichloropropane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
1,4-Dichlorobenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
2,2-Dichloropropane	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
2-Butanone	ND	NA	50.0	NA	µg/L	6/27/2014 3:42 PM	
2-Chloroethyl vinyl ether	ND	NA	25.0	NA	µg/L	6/27/2014 3:42 PM	PA/VA
2-Chlorotoluene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
2-Hexanone	ND	NA	50.0	NA	µg/L	6/27/2014 3:42 PM	
4-Chlorotoluene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
p-Isopropyltoluene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	
4-Methyl-2-pentanone	ND	NA	50.0	NA	µg/L	6/27/2014 3:42 PM	PA/VA
Acetone	ND	NA	50.0	NA	µg/L	6/27/2014 3:42 PM	PA/VA
Acrylonitrile	ND	NA	50.0	NA	µg/L	6/27/2014 3:42 PM	PA/VA
Benzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	PA/VA
Bromobenzene	ND	NA	5.00	NA	µg/L	6/27/2014 3:42 PM	

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 1:00:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-02A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 LAB COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
Bromochloromethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
Bromodichloromethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Bromoform	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Bromomethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Carbon disulfide	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM	
Carbon tetrachloride	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Chlorobenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Chloroethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Chloroform	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Chloromethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
cis-1,2-Dichloroethene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
cis-1,3-Dichloropropene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Dibromochloromethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Dibromomethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
Dichlorodifluoromethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
Ethylbenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Hexachlorobutadiene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	
Iodomethane	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM	
Isopropylbenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
m,p-Xylene	ND	NA	10.0	NA		µg/L	6/27/2014 3:42 PM	PA/VA
MTBE	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Methylene chloride	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
n-Butylbenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	
n-Propylbenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	
Naphthalene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
o-Xylene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
sec-Butylbenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	
Styrene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA
tert-Butylbenzene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	
Tetrachloroethene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Toluene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
trans-1,2-Dichloroethene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
trans-1,3-Dichloropropene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Trichloroethene	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Trichlorofluoromethane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Vinyl acetate	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM	
Vinyl chloride	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM	PA/VA
Surr: 1,2-Dichloroethane-d4	107	NA	68.7-129	NA		%REC	6/27/2014 3:42 PM	

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 1:00:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-02A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 LAB COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
Surr: 4-Bromofluorobenzene	96.1	NA	71.8-127	NA		%REC	6/27/2014 3:42 PM	
Surr: Dibromofluoromethane	104	NA	74.3-124	NA		%REC	6/27/2014 3:42 PM	
Surr: Toluene-d8	97.2	NA	71.4-129	NA		%REC	6/27/2014 3:42 PM	

Notes:

2-Chloroethylvinyl ether is unstable under conditions of acidic preservation.

Elevated PQLs are due to matrix interference. Sample foamed during analysis.

VOLATILE ORGANIC COMPOUNDS - ADDITIONAL			Method: EPA 624				Analyst: RB
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
1,4-Dioxane	ND	NA	1,000	NA		µg/L	6/27/2014 3:42 PM
1-Propanol	ND	NA	500	NA		µg/L	6/27/2014 3:42 PM
2-Propanol	ND	NA	500	NA		µg/L	6/27/2014 3:42 PM
Acetaldehyde	ND	NA	50.0	NA		µg/L	7/1/2014 8:55 PM
Acetonitrile	ND	NA	500	NA		µg/L	6/27/2014 3:42 PM
Allyl chloride	ND	NA	10.0	NA		µg/L	6/27/2014 3:42 PM
Chloroprene	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
Cyclohexane	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM
Cyclohexanone	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM
Diethyl ether	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
Ethanol	ND	NA	1,000	NA		µg/L	6/27/2014 3:42 PM
Ethyl acetate	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
Ethyl methacrylate	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM
Hexachloroethane	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM
Isobutyl alcohol	ND	NA	500	NA		µg/L	6/27/2014 3:42 PM
Isopropyl acetate	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
Isopropyl ether	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
Methacrylonitrile	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM
Methyl methacrylate	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM
n-Butyl alcohol	ND	NA	500	NA		µg/L	6/27/2014 3:42 PM
Pentachloroethane	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM
Pentyl acetate	ND	NA	25.0	NA		µg/L	6/27/2014 3:42 PM
Propionitrile	ND	NA	500	NA		µg/L	6/27/2014 3:42 PM
tert-Amyl alcohol	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM
tert-Amyl Ethyl Ether	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM
tert-Amyl Methyl Ether	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM
tert-Butyl alcohol	ND	NA	1,000	NA		µg/L	6/27/2014 3:42 PM
tert-Butyl Ethyl Ether	ND	NA	5.00	NA		µg/L	6/27/2014 3:42 PM
Tetrahydrofuran	ND	NA	250	NA		µg/L	6/27/2014 3:42 PM

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 1:00:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-02A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 LAB COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
trans-1,4-Dichloro-2-butene	ND	NA	50.0	NA		µg/L	6/27/2014 3:42 PM	
Surr: 1,2-Dichloroethane-d4	106	NA	80-120	NA		%REC	6/27/2014 3:42 PM	
Surr: 4-Bromofluorobenzene	96.1	NA	80-120	NA		%REC	6/27/2014 3:42 PM	
Surr: Dibromofluoromethane	106	NA	80-120	NA		%REC	6/27/2014 3:42 PM	
Surr: Toluene-d8	98.2	NA	80-120	NA		%REC	6/27/2014 3:42 PM	

Notes:

Elevated PQLs are due to matrix interference. Sample foamed during analysis.

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 9:11:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-03A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
METALS BY ICP			**Method: EPA 200.7 Rev. 4.4 (1994)**				**Analyst: DS**	
Aluminum	0.183	NA	0.0050	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Antimony	ND	NA	0.0200	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Barium	0.172	NA	0.0050	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Boron	1.19	NA	0.0500	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Cadmium	ND	NA	0.0010	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Chromium	0.0021	NA	0.0050	NA	J	mg/L	6/26/2014 1:55 PM	PA/VA
Cobalt	0.0011	NA	0.0050	NA	J	mg/L	6/26/2014 1:55 PM	PA/VA
Copper	ND	NA	0.0050	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Iron	0.0807	NA	0.0500	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Lead	ND	NA	0.0100	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Magnesium	8.97	NA	0.500	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Manganese	0.0705	NA	0.0050	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Molybdenum	0.0033	NA	0.0050	NA	J	mg/L	6/26/2014 1:55 PM	PA/VA
Nickel	0.0026	NA	0.0050	NA	J	mg/L	6/26/2014 1:55 PM	PA/VA
Selenium	ND	NA	0.0200	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Silver	ND	NA	0.0050	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Thallium	ND	NA	0.0100	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Tin	ND	NA	0.500	NA		mg/L	7/2/2014 1:59 PM	PA/VA
Titanium	ND	NA	0.0100	NA		mg/L	6/26/2014 1:55 PM	PA/VA
Zinc	0.0055	NA	0.0200	NA	J	mg/L	6/26/2014 1:55 PM	PA/VA
MERCURY, Total			**Method: EPA 245.1, Rev. 3.0 (1994)**				**Analyst: BG**	
Mercury	ND	NA	0.0010	NA		mg/L	6/27/2014 11:51 AM	PA/VA
PESTICIDES/PCBS			**Method: EPA 608**				**Analyst: NC**	
Aroclor 1016	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aroclor 1221	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aroclor 1232	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aroclor 1242	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aroclor 1248	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aroclor 1254	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aroclor 1260	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Aldrin	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
alpha-BHC	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
beta-BHC	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
delta-BHC	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 9:11:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-03A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
gamma-BHC	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Chlordane	ND	NA	0.00514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
4,4'-DDD	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
4,4'-DDE	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
4,4'-DDT	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Dieldrin	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Endosulfan I	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Endosulfan II	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Endosulfan sulfate	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Endrin	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Endrin aldehyde	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Heptachlor	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Heptachlor epoxide	ND	NA	0.000514	NA		mg/L	6/26/2014 5:40 AM	PA/VA
Toxaphene	ND	NA	0.00514	NA		mg/L	6/26/2014 9:33 AM	PA/VA
Surr: tetrachloro-m-xylene	62.0	NA	19.49-150	NA		%REC	6/26/2014 5:40 AM	
SEMIVOLATILE ORGANIC COMPOUNDS			**Method: EPA 625 (1982)**				**Analyst: JD**	
Acenaphthene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Acenaphthylene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Anthracene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Benzo(a)anthracene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Benzidine	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Benzo(a)pyrene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Benzo(b)fluoranthene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Benzo(g,h,i)perylene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Benzo(k)fluoranthene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Bis(2-chloroethoxy)methane	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Bis(2-chloroethyl)ether	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Bis(2-chloroisopropyl)ether	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Bis(2-ethylhexyl)phthalate	0.0306	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
4-Bromophenyl phenyl ether	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Butyl benzyl phthalate	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
4-Chloro-3-methylphenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2-Chloronaphthalene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA
2-Chloronaphthalene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2-Chlorophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
4-Chlorophenyl phenyl ether	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Chrysene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 9:11:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-03A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
Dibenz(a,h)anthracene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Di-n-butyl phthalate	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
1,2-Dichlorobenzene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA
1,3-Dichlorobenzene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA
1,4-Dichlorobenzene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA
3,3'-Dichlorobenzidine	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2,4-Dichlorophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Diethyl phthalate	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2,4-Dimethylphenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Dimethyl phthalate	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
4,6-Dinitro-2-methylphenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2,4-Dinitrophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2,4-Dinitrotoluene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2,6-Dinitrotoluene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Di-n-octyl phthalate	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Fluoranthene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Fluorene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Hexachlorobenzene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Hexachlorobutadiene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Hexachlorocyclopentadiene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Hexachloroethane	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Indeno(1,2,3-cd)pyrene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Isophorone	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Naphthalene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Nitrobenzene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2-Nitrophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
4-Nitrophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
N-Nitrosodi-n-propylamine	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
N-Nitrosodimethylamine	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
N-Nitrosodiphenylamine	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Pentachlorophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Phenanthrene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Phenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Pyrene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
1,2,4-Trichlorobenzene	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
2,4,6-Trichlorophenol	ND	NA	0.0104	NA		mg/L	7/1/2014 12:36 AM	PA/VA
Surr: 2-Fluorophenol	51.9	NA	25.9-110	NA		%REC	7/1/2014 12:36 AM	
Surr: Phenol-d5	42.3	NA	8.2-110	NA		%REC	7/1/2014 12:36 AM	

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 9:11:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-03A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
Surr: Nitrobenzene-d5	112	NA	62.2-110	NA	S	%REC	7/1/2014 12:36 AM	
Surr: 2-Fluorobiphenyl	85.9	NA	54.6-110	NA		%REC	7/1/2014 12:36 AM	
Surr: 2,4,6-Tribromophenol	86.3	NA	61.7-110	NA		%REC	7/1/2014 12:36 AM	
Surr: 4-Terphenyl-d14	78.0	NA	10.7-110	NA		%REC	7/1/2014 12:36 AM	
SURFACTANTS			**Method: SM5540 C-2000**				**Analyst: SP**	
MBAS (calibrated on MW340 LAS)	ND	NA	0.0625	NA		mg/L	6/25/2014 10:40 AM	PA/VA
Chemical Oxygen Demand			**Method: EPA 410.4, Rev. 2 (1993)**				**Analyst: BA**	
Chemical Oxygen Demand	162	NA	50	NA		mg/L	6/25/2014 9:30 AM	PA/VA
ANIONS by ION CHROMATOGRAPHY			**Method: EPA 300.0, Rev.2.1 (1993)**				**Analyst: CF**	
Bromide	1.29	NA	0.10	NA		mg/L	6/25/2014 10:05 PM	PA/VA
Sulfate	65.4	NA	5.00	NA		mg/L	6/25/2014 10:05 PM	PA/VA
ORGANIC NITROGEN			**Method: EPA 351.2, Rev. 2.0 (1993) / EPA 350.1**				**Analyst: KS**	
Nitrogen, Organic	2.02	NA	1.00	NA		mg/L	7/1/2014 1:15 PM	
PHOSPHORUS			**Method: SM4500-P BE-1999**				**Analyst: BA**	
Phosphorus, Total	0.13	NA	0.05	NA		mg/L	6/25/2014 12:00 PM	PA/VA
AMMONIA NITROGEN			**Method: EPA 350.1, Rev.2. (1993)**				**Analyst: AL**	
Nitrogen, Ammonia (As N)	ND	NA	1.00	NA		mg/L	6/25/2014 10:16 AM	PA/VA
ORGANIC CARBON, TOTAL			**Method: SM5310 C-2000**				**Analyst: DSD**	
Total Organic Carbon	39.1	NA	1.00	NA		mg/L	7/1/2014 10:43 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 8:09:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-04A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 002 GRAB	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
OIL and GREASE			**Method: EPA 1664 Rev. A**				**Analyst: KS**	
Oil & Grease	ND	NA	5.0	NA		mg/L	6/25/2014 11:00 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 8:15:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-05A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 002 COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
METALS BY ICP			**Method: EPA 200.7 Rev. 4.4 (1994)**				**Analyst: DS**	
Aluminum	0.138	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Antimony	ND	NA	0.0200	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Barium	0.0569	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Boron	0.0160	NA	0.0500	NA	J	mg/L	6/26/2014 2:02 PM	PA/VA
Cadmium	ND	NA	0.0010	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Chromium	0.0012	NA	0.0050	NA	J	mg/L	6/26/2014 2:02 PM	PA/VA
Cobalt	ND	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Copper	0.0031	NA	0.0050	NA	J	mg/L	6/26/2014 2:02 PM	PA/VA
Iron	0.265	NA	0.0500	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Lead	ND	NA	0.0100	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Magnesium	8.17	NA	0.500	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Manganese	0.0332	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Molybdenum	ND	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Nickel	ND	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Selenium	ND	NA	0.0200	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Silver	ND	NA	0.0050	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Tin	ND	NA	0.500	NA		mg/L	7/2/2014 2:06 PM	PA/VA
Titanium	ND	NA	0.0100	NA		mg/L	6/26/2014 2:02 PM	PA/VA
Zinc	0.0042	NA	0.0200	NA	J	mg/L	6/26/2014 2:02 PM	PA/VA
MERCURY, Total			**Method: EPA 245.1, Rev. 3.0 (1994)**				**Analyst: BG**	
Mercury	ND	NA	0.0010	NA		mg/L	6/27/2014 11:53 AM	PA/VA
Chemical Oxygen Demand			**Method: EPA 410.4, Rev. 2 (1993)**				**Analyst: BA**	
Chemical Oxygen Demand	12	NA	10	NA		mg/L	6/25/2014 9:30 AM	PA/VA
ANIONS by ION CHROMATOGRAPHY			**Method: EPA 300.0, Rev.2.1 (1993)**				**Analyst: CF**	
Bromide	ND	NA	0.10	NA		mg/L	6/25/2014 10:24 PM	PA/VA
Sulfate	36.9	NA	5.00	NA		mg/L	6/25/2014 10:24 PM	PA/VA
ANIONS by ION CHROMATOGRAPHY			**Method: SM4110B-2000**				**Analyst: AL**	
Nitrogen, Nitrate-Nitrite	0.31	NA	0.10	NA		mg/L	6/25/2014 9:11 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 8:15:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-05A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 002 COMP	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
ORGANIC NITROGEN			**Method: EPA 351.2, Rev. 2.0 (1993) / EPA 350.1**				**Analyst: KS**	
Nitrogen, Organic	0.16	NA	0.10	NA		mg/L	7/1/2014 1:15 PM	
TOTAL KJELDAHL NITROGEN (TKN)			**Method: EPA 351.2, Rev. 2.0 (1993)**				**Analyst: AL**	
Nitrogen, Kjeldahl, Total	0.16	NA	0.50	NA	J	mg/L	6/26/2014 9:28 AM	PA/VA
PHOSPHORUS			**Method: SM4500-P BE-1999**				**Analyst: BA**	
Phosphorus, Total	0.02	NA	0.05	NA	J	mg/L	6/25/2014 12:00 PM	PA/VA
AMMONIA NITROGEN			**Method: EPA 350.1, Rev.2. (1993)**				**Analyst: AL**	
Nitrogen, Ammonia (As N)	ND	NA	0.10	NA		mg/L	6/25/2014 10:16 AM	PA/VA
TOTAL SUSPENDED SOLIDS			**Method: SM2540 D-1997**				**Analyst: SF**	
Total Suspended Solids	8	NA	1	NA		mg/L	6/25/2014 11:04 AM	PA/VA
ORGANIC CARBON, TOTAL			**Method: SM5310 C-2000**				**Analyst: DSD**	
Total Organic Carbon	3.99	NA	1.00	NA		mg/L	7/1/2014 10:43 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 8:26:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-06A	**Matrix:**	Waste Water
Client Sample ID:	001 OUTFALL GRAB	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
OIL and GREASE			**Method: EPA 1664 Rev. A**				**Analyst: KS**	
Oil & Grease	ND	NA	5.0	NA		mg/L	6/25/2014 11:00 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 8:31:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-07A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 001 COMPOSITE	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
METALS BY ICP			**Method: EPA 200.7 Rev. 4.4 (1994)**				**Analyst: DS**	
Aluminum	0.0979	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Antimony	ND	NA	0.0200	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Barium	0.0558	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Boron	ND	NA	0.0500	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Cadmium	ND	NA	0.0010	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Chromium	0.0012	NA	0.0050	NA	J	mg/L	6/26/2014 2:09 PM	PA/VA
Cobalt	ND	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Copper	0.0038	NA	0.0050	NA	J	mg/L	6/26/2014 2:09 PM	PA/VA
Iron	0.152	NA	0.0500	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Lead	ND	NA	0.0100	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Magnesium	7.85	NA	0.500	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Manganese	0.0219	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Molybdenum	ND	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Nickel	ND	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Selenium	ND	NA	0.0200	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Silver	ND	NA	0.0050	NA		mg/L	6/26/2014 2:09 PM	PA/VA
Tin	ND	NA	0.500	NA		mg/L	7/2/2014 2:19 PM	PA/VA
Titanium	0.0020	NA	0.0100	NA	J	mg/L	6/26/2014 2:09 PM	PA/VA
Zinc	0.0031	NA	0.0200	NA	J	mg/L	6/26/2014 2:09 PM	PA/VA
MERCURY, Total			**Method: EPA 245.1, Rev. 3.0 (1994)**				**Analyst: BG**	
Mercury	ND	NA	0.0010	NA		mg/L	6/27/2014 11:55 AM	PA/VA
Chemical Oxygen Demand			**Method: EPA 410.4, Rev. 2 (1993)**				**Analyst: BA**	
Chemical Oxygen Demand	13	NA	10	NA		mg/L	6/25/2014 9:30 AM	PA/VA
ANIONS by ION CHROMATOGRAPHY			**Method: EPA 300.0, Rev.2.1 (1993)**				**Analyst: CF**	
Bromide	ND	NA	0.10	NA		mg/L	6/25/2014 10:43 PM	PA/VA
Sulfate	38.1	NA	5.00	NA		mg/L	6/25/2014 10:43 PM	PA/VA
ANIONS by ION CHROMATOGRAPHY			**Method: SM4110B-2000**				**Analyst: AL**	
Nitrogen, Nitrate-Nitrite	0.31	NA	0.10	NA		mg/L	6/25/2014 9:29 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1406R91

Date Reported: 7/7/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	6/24/2014 8:31:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	6/24/2014
Lab ID:	1406R91-07A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 001 COMPOSITE	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
ORGANIC NITROGEN			**Method: EPA 351.2, Rev. 2.0 (1993) / EPA 350.1**				**Analyst: KS**	
Nitrogen, Organic	0.11	NA	0.10	NA		mg/L	7/1/2014 1:15 PM	
TOTAL KJELDAHL NITROGEN (TKN)			**Method: EPA 351.2, Rev. 2.0 (1993)**				**Analyst: AL**	
Nitrogen, Kjeldahl, Total	0.10	NA	0.50	NA	J	mg/L	6/26/2014 9:29 AM	PA/VA
PHOSPHORUS			**Method: SM4500-P BE-1999**				**Analyst: BA**	
Phosphorus, Total	ND	NA	0.05	NA		mg/L	6/25/2014 12:00 PM	PA/VA
AMMONIA NITROGEN			**Method: EPA 350.1, Rev.2. (1993)**				**Analyst: AL**	
Nitrogen, Ammonia (As N)	ND	NA	0.10	NA		mg/L	6/25/2014 10:17 AM	PA/VA
TOTAL SUSPENDED SOLIDS			**Method: SM2540 D-1997**				**Analyst: SF**	
Total Suspended Solids	4	NA	1	NA		mg/L	6/25/2014 11:04 AM	PA/VA
ORGANIC CARBON, TOTAL			**Method: SM5310 C-2000**				**Analyst: DSD**	
Total Organic Carbon	3.49	NA	1.00	NA		mg/L	7/1/2014 10:43 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1409A27

Date Reported: 9/16/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 8:44:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A27-01A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 001 GRAB	**Site ID:**	VIRGINIA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
E-COLI BY MPN - ROANOKE			**Method: COLILERT MPN**				**Analyst: RP**	
E-Coli	2	NA	1	NA		MPN/100mL	9/10/2014 3:20 PM	VELAP
FECAL COLIFORM BY MEMBRANE FILTER - ROANOKE			**Method: SM9222 D-1997**				**Analyst: AW**	
Fecal Coliform	1	NA	1	NA		col/100mL	9/10/2014 2:58 PM	VELAP

REI Consultants, Inc. - Analytical Report

WO#: 1409A27

Date Reported: 9/16/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 8:31:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A27-02A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 001	**Site ID:**	VIRGINIA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
ANIONS by ION CHROMATOGRAPHY			**Method: EPA 300.0, Rev.2.1 (1993)**				**Analyst: CF**	
Fluoride	0.08	NA	0.20	NA	J	mg/L	9/11/2014 6:44 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1409A27

Date Reported: 9/16/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 8:52:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A27-03A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 002 GRAB	**Site ID:**	VIRGINIA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
E-COLI BY MPN - ROANOKE			**Method: COLILERT MPN**				**Analyst: RP**	
E-Coli	7	NA	1	NA		MPN/100mL	9/10/2014 3:20 PM	VELAP
FECAL COLIFORM BY MEMBRANE FILTER - ROANOKE			**Method: SM9222 D-1997**				**Analyst: AW**	
Fecal Coliform	4	NA	1	NA		col/100mL	9/10/2014 2:58 PM	VELAP

REI Consultants, Inc. - Analytical Report

WO#: 1409A27

Date Reported: 9/16/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 8:23:00 AM
Project:	VPDES PERMIT RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A27-04A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 002	**Site ID:**	VIRGINIA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
ANIONS by ION CHROMATOGRAPHY			**Method: EPA 300.0, Rev.2.1 (1993)**				**Analyst: CF**	
Fluoride	0.14	NA	0.20	NA	J	mg/L	9/10/2014 10:35 AM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1409A01

Date Reported: 9/18/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 9:22:00 AM
Project:	VPDES RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A01-01A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
METALS BY ICP			**Method: EPA 200.7 Rev. 4.4 (1994)**				**Analyst: JD**	
Arsenic	ND	NA	0.0200	NA		mg/L	9/16/2014 11:04 AM	PA/VA
Beryllium	ND	NA	0.0010	NA		mg/L	9/16/2014 11:04 AM	PA/VA
SEMIVOLATILE ORGANIC COMPOUNDS			**Method: EPA 625 (1982)**				**Analyst: JC**	
1,2-Diphenylhydrazine	ND	NA	0.0083	NA		mg/L	9/17/2014 12:30 AM	PA/VA
Surr: Nitrobenzene-d5	85.3	NA	62.2-110	NA		%REC	9/17/2014 12:30 AM	
Surr: 2-Fluorobiphenyl	79.5	NA	54.6-110	NA		%REC	9/17/2014 12:30 AM	
Surr: 4-Terphenyl-d14	90.3	NA	10.7-110	NA		%REC	9/17/2014 12:30 AM	
ACROLEIN BY E624			**Method: EPA 624**				**Analyst: JM**	
Acrolein	ND	NA	500	NA		µg/L	9/12/2014 2:42 PM	PA/VA
VOLATILE ORGANIC COMPOUNDS			**Method: EPA 624**				**Analyst: JM**	
2-Chloroethyl vinyl ether	ND	NA	50.0	NA		µg/L	9/16/2014 10:01 PM	PA/VA
Surr: 1,2-Dichloroethane-d4	98.7	NA	68.7-129	NA		%REC	9/16/2014 10:01 PM	
Surr: 4-Bromofluorobenzene	105	NA	71.8-127	NA		%REC	9/16/2014 10:01 PM	
Surr: Dibromofluoromethane	96.3	NA	74.3-124	NA		%REC	9/16/2014 10:01 PM	
Surr: Toluene-d8	102	NA	71.4-129	NA		%REC	9/16/2014 10:01 PM	

Notes:

Elevated PQLs are due to matrix interference. Sample foamed during analysis.

SULFIDE			**Method: SW9034 (1996)**				**Analyst: CC**	
Sulfide (As S)	ND	NA	1.00	NA		mg/L	9/16/2014 9:00 AM	
ANIONS by ION CHROMATOGRAPHY			**Method: EPA 300.0, Rev.2.1 (1993)**				**Analyst: CF**	
Fluoride	0.21	NA	0.20	NA		mg/L	9/11/2014 6:25 AM	PA/VA
PHENOLICS			**Method: EPA 420.1, Rev. 1978)**				**Analyst: JJ**	
Phenolics	ND	NA	0.010	NA		mg/L	9/15/2014 12:00 PM	PA/VA

REI Consultants, Inc. - Analytical Report

WO#: 1409A01

Date Reported: 9/18/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 9:36:00 AM
Project:	VPDES RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A01-02A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 FECAL	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
FECAL COLIFORM BY MEMBRANE FILTER - ROANOKE		**Method: SM9222 D-1997**					**Analyst: AW**	
Fecal Coliform	13	NA	1	NA		col/100mL	9/10/2014 2:58 PM	VELAP

REI Consultants, Inc. - Analytical Report

WO#: 1409A01

Date Reported: 9/18/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 9:36:00 AM
Project:	VPDES RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A01-03A	**Matrix:**	Waste Water
Client Sample ID:	OUTFALL 003 ECOLI	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
E-COLI BY MPN - ROANOKE			**Method: COLILERT MPN**				**Analyst: RP**	
E-Coli	10	NA	1	NA		MPN/100mL	9/10/2014 3:20 PM	VELAP

REI Consultants, Inc. - Analytical Report

WO#: 1409A01

Date Reported: 9/18/2014

Client:	GEORGIA PACIFIC / BIG ISLAND VA	**Collection Date:**	9/9/2014 12:00:00 AM
Project:	VPDES RENEWAL	**Date Received:**	9/9/2014
Lab ID:	1409A01-04A	**Matrix:**	Trip Blank
Client Sample ID:	TRIP BLANK	**Site ID:**	VA

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
ACROLEIN BY E624			**Method: EPA 624**				**Analyst: JM**	
Acrolein	ND	NA	10	NA		µg/L	9/12/2014 2:09 PM	PA/VA
VOLATILE ORGANIC COMPOUNDS			**Method: EPA 624**				**Analyst: JM**	
2-Chloroethyl vinyl ether	ND	NA	5.00	NA		µg/L	9/12/2014 2:09 PM	PA/VA
Surr: 1,2-Dichloroethane-d4	114	NA	68.7-129	NA		%REC	9/12/2014 2:09 PM	
Surr: 4-Bromofluorobenzene	105	NA	71.8-127	NA		%REC	9/12/2014 2:09 PM	
Surr: Dibromofluoromethane	102	NA	74.3-124	NA		%REC	9/12/2014 2:09 PM	
Surr: Toluene-d8	103	NA	71.4-129	NA		%REC	9/12/2014 2:09 PM	